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Appendix

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Kern county. Planning dept.
Final envir. impact report for Rio Bravo
Ranch specific plan — Appendix.

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KERN COUNTY PLANNING COMMISSION

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Director-Secretary

1103 Golden State Avenue
BAKERSFIELD, CALIFORNIA-93301
Telephone (805) 861-2615

March 4, 1975

File: PRELIMINARY DRAFT EIR
Rio Bravo Ranch

California Regional Water
Quality Control Board
Central Valley Region
P. O. Box 2188
Fresno, CA 93723

Gentlemen:

Attached find a copy of a preliminary Draft Environmental Impact Report for development of the Rio Bravo Ranch located in the Lake Ming area of the Kern River Park, northeast of Bakersfield.

Pursuant to Section 15066 of the State EIR Guidelines we are requesting any comments or recommendations you may have in order to allow the Planning Staff to prepare the Draft Environmental Impact Report for circulation.

We herein request you return your comments to our office by March 20, 1975. Should you have any questions regarding this matter, please contact this office.

Very truly yours,

JACK L. DALTON
Planning Director

By: FRED SIMON
Principal Planner

dh

Encl:

cc: Rickett, Ward & Delmarter
2901 "H" Street
Bakersfield, CA 93301

Attn: Charles Karoly

Office Memorandum • KERN COUNTY

TO : HEALTH DEPARTMENT/PUBLIC WORKS/PARKS & RECREATION DATE: March 4, 1975
KERN RIVER GOLF COURSE

FROM : KERN COUNTY PLANNING COMMISSION

SUBJECT: PRELIMINARY DRAFT EIR-RIO BRAVO RANCH

Attached find a copy of a preliminary Draft Environmental Impact Report for development of the Rio Bravo Ranch located in the Lake Ming area of the Kern River Park, Northeast of Bakersfield.

Pursuant to Section 15066 of the State EIR Guidelines we are requesting any comments or recommendations you may have in order to allow the Planning Staff to prepare the Draft Environmental Impact Report for circulation.

We herein request you return your comments to our office by March 20, 1975. Should you have any questions regarding this matter, please contact this office.

FS:dh

Attachment

Office Memorandum • KERN COUNTY

	Admin	
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TO : Planning Department
Current Planning Division

DATE: March 20, 1975

FROM : Vernon S. Reichard, Director
Environmental Health Division, Kern County Health Department

SUBJECT: Rio Bravo Tennis Ranch Preliminary EIR

PLANNING COMMISSION

Thank you for transmitting this preliminary EIR for our review. Health Department staff have reviewed the subject document, and offer the following comments:

Community Noise:

As correctly noted in the report, the Health Department had intended to monitor noise levels at the project site on February 22-23, and March 8-9, 1975. Unfortunately, due to inclement weather, high winds, and other commitments, the staff was unable to conduct noise monitoring March 8-9. The results from February 22-23 have been tabulated, however, and are included in the following table. Note that these results apply only to outboard racing activities; we plan to monitor the drag racing boats April 5-6, 1975.

Description:	Ambient Noise	Condominium Site	Subdivision Site
Date:	11/18/74	2/22/75	2/22/75
Time:	3:00-3:30 P.M.	10:23-11:23 A.M.	11:33 A.M.-12:33 A.M.
No. of Samples:	1733	3583	3604
L maximum	56 dB(A)	68 dB(A)	75 dB(A)
L_1	52 dB(A)	61 dB(A)	67 dB(A)
L_{10}	46 dB(A)	56 dB(A)	60 dB(A)
L_{50}	42 dB(A)	48 dB(A)	43 dB(A)
L_{90}	41 dB(A)	40 dB(A)	40 dB(A)
L_{99}	40 dB(A)	40 dB(A)	40 dB(A)
L_{eq}	44.3 dB(A)	53.2 dB(A)	56.5 dB(A)

Note: dB(A) means decibels, A-weighted, re: 20 micropascals. L_x means the level exceeded X% of the time; L_{eq} means the energy-equivalent level.

As noted in the EIR, the ambient noise environment at the project site is within acceptable limits for rural residential land uses. When the outboard racing activities take place, however, the immediate effect is a change in the character of the noise environment. While the ambient noise is largely

Office Memorandum • KERN COUNTY

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TO : Planning Department
Current Planning Division

DATE: March 20, 1975

FROM : Vernon S. Reichard, Director
Environmental Health Division, Kern County Health Department

SUBJECT: Rio Bravo Tennis Ranch Preliminary EIR

determined by wind, birds, distant aircraft, and sporadic auto traffic, when the outboard racing activities are present, the noise environment is dominated in tonal characteristics by the whining of small engines and roaring of larger engines. Even where measured noise levels are not significantly raised by racing activities, the intrusive character of the boat engine noise (i.e., its tonal content) reminds the observer that the noise environment has changed.

In terms of changes in noise levels, it can be seen that outboard racing causes an increase in maximum noise levels of 12 to 19 dB(A), increases in L_1 of 9 to 15 dB(A), and increases in L_{10} of 10 to 14 dB(A). The median noise level (L_{50}) was raised at the condominium site, while at the subdivision site little change was noted because of a lull in racing activity from approximately 11:40 A.M. to 12:00 noon. Thus the initial impression gained from the monitoring results is that noise levels at the project site are raised significantly by outboard racing activities, particularly in terms of increased exposure to higher noise levels. It also appears that, given similar racing conditions, the subdivision site would be "noisier" than the condominium site. This is apparently due to the shielding effect offered by a slight rise of the land just north of the condominium site.

The staff compared outboard race date noise levels at both the subdivision and condominium sites to the standards of the model noise ordinance now being prepared by the National Environmental Health Association (NEHA). Those standards are similar to those of the Orange County Noise Ordinance and other ordinances in use in California. According to the NEHA ordinance, the project site would be subject to the following provisions:

Noise Standard	Time Interval
50 dB(A)	7:00 A.M. to 10:00 P.M.
45 dB(A)	10:00 P.M. to 7:00 A.M.

Section 5.(b) It shall be unlawful for any person at any location within the incorporated (unincorporated) area of the City (County) to create any noise, or to allow the creation of any noise on properly owned, leased, occupied or otherwise controlled by such person, which causes the noise level when measured on any other property either incorporated or unincorporated, to exceed:

(1) The noise standard for a cumulative period of more than thirty minutes in any hour; or

(2) The noise standard plus 5 dB(A) for a cumulative period of more than fifteen minutes in any hour; or

(3) The noise standard plus 10 dB(A) for a cumulative period of more than five minutes in any hour; or

(4) The noise standard plus 15 dB(A) for a cumulative period of more than one minute in any hour; or

(5) The noise standard plus 20 dB(A) for any period of time.

It must also be noted that State law (Harbors and Navigation Code Sections 654 and 654.05) governs the noise emissions from motorboats operating on inland waterways, and exempts boats in bonafide racing activities from any muffling requirements. Thus the NEHA model ordinance could not be used to limit noise levels generated by boats operating upon Lake Ming. However, we may use the ordinance as a comparison and thus gain some insight into the anticipated response of future residents exposed to the noise levels generated by outboard racing activities at Lake Ming.

Comparison of the NEHA ordinance standards to noise levels from outboard racing on Lake Ming as measured at the Rio Bravo Ranch project site reveals that no violation would be noted at the condominium site, but violations of Section 5(b), paragraphs (3), (4), and (5) would be noted at the subdivision site. Specifically, the noise standard was exceeded by 10 dB(A) for 7.25 minutes, by 15 dB(A) for 1.433 minutes, and by 20 dB(A) for 0.133 minutes. Recognizing that the survey sample included only about 40 minutes of actual racing or practice, one may assume that the standards would have been violated by a greater margin had racing occurred throughout most of the 1-hour sampling period.

The NEHA model ordinance standards are based upon authoritative information which indicates the noise levels which people will accept without complaining, and which are necessary to reduce annoyance and health-related effects. At the proposed subdivision site, then, one may anticipate that noise levels generated by outboard boat racing would trigger complaints

TO : Planning Department
Current Planning Division

DATE: March 20, 1975

FROM : Vernon S. Reichard, Director
Environmental Health Division, Kern County Health Department

SUBJECT: Rio Bravo Tennis Ranch Preliminary EIR

from residents. A larger number of residents could be expected to be annoyed, even though they might not complain to authorities. This annoyance would result from the increased noise levels, the intrusive character of the noise, and the relatively constant exposure over a 2-day period. Although this Department has not yet conducted monitoring of sound levels generated by drag racing boats, it is reasonable to suppose that those sound levels will be equal to or greater than those generated by outboard racing boats. Thus one might surmise that drag racing boat activities will yield similar effects at the subdivision site, and possibly at the condominium site. We plan to monitor boat drag races April 5-6, 1975, to determine whether these suppositions are correct.

It appears, then, that future residents of the Rio Bravo Ranch project may be subject to occasional exposure to noise from boat racing on Lake Ming which will be of sufficient intensity and of such a character as to result in annoyance and complaints to authorities. In that noise levels from motorboats are established by State law, local government would be unable to combat the problem directly. Instead, it is possible that public complaints could prompt local officials to deny use of Lake Ming for motorboat racing. Thus one of the potential impacts of the Rio Bravo Ranch project is the occasional exposure of future residents to objectionable noise levels; another potential impact would be the cessation of motorboat racing at Lake Ming. Alternatively, local officials could, as a condition of a permit to use Lake Ming for motorboat racing, require that all racing boats be adequately muffled. This approach could cause boat racing at Lake Ming to become uneconomical, as visiting boaters would have to change equipment in order to compete.

One must remember, of course, that boat racing at Lake Ming is reported to occur approximately 8 weekends (16 days) per year. On an annual basis, noise levels would not appear objectionable, but on those few weekends, residents might become quite upset. Mitigating measures should recognize this fact. Possible mitigation measures might include:

1. Erection of sound barriers (e.g., walls, earthen berms, etc.) at the tract boundaries. (Example attached.)

2. Setback of residential areas to take advantage of sound attenuation by distance or natural barriers.

TO : Planning Department
Current Planning Division

DATE: March 20, 1975

FROM : Vernon S. Reichard, Director
Environmental Health Division, Kern County Health Department

SUBJECT: Rio Bravo Tennis Ranch Preliminary EIR

3. More stringent noise insulation standards could be imposed upon dwellings in the project area.

4. Potential lot buyers could be informed prior to purchase that noise levels are occasionally objectionable because of boat racing on Lake Ming.

5. Curfews or time restrictions could be imposed on boat racing at Lake Ming.

6. Mufflers could be required on motorboats at all times as a condition of use of Lake Ming.

7. Motorboat racing could be prohibited on Lake Ming.

It should be recognized that, in most instances, the key to a quiet environment is in the planning, layout, and design of a project, whether it is a building, a subdivision, or a city. Once construction is completed, it is usually much more expensive and difficult to achieve satisfactory results. More satisfactory results can be obtained if noise considerations are taken into account at the beginning of a project.

Liquid Waste Disposal:

Initially, staff review of the EIR indicated that certain documents should be included to ensure that all pertinent information would be supplied by the EIR. However, the letter from the Central Valley Regional Water Quality Control Board dated March 11, 1975, requested much of that information, and the reply from Rickett, Ward, and Delmarter dated March 14, 1975 appears to have supplied the necessary information. Thus it is the staff's opinion that inclusion into the EIR of the information submitted by Rickett, Ward and Delmarter to your Department by letter of March 14, 1975 should answer the needs of the EIR in regard to the aspects of liquid waste disposal. It should be noted that staff has met with the engineer and Dr. Winneberger to discuss details of the project. It is anticipated that satisfaction of Health Department and Water Quality Control Board requirements will minimize the environmental impacts of liquid waste disposal for the Rio Bravo Ranch project, and adequately protect public health and water quality.

VSR:JB:lb
enclosure

-5005

SOURCE: BEATON AND BOURGET, OP. CIT., FOOTNOTE 20.

AN AESTHESTIC CONCEPT OF A NOISE SHIELD NEAR RESIDENCES IN FLAT TERRAIN

Office Memorandum • KERN COUNTY

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TO : Planning Department
Current Planning Division

DATE: May 5, 1975

FROM : Vernon S. Reichard, Director
Environmental Health Division, Kern County Health Department

SUBJECT: Rio Bravo Tennis Ranch
Preliminary EIR

In accordance with our office memorandum of March 20, 1975, Health Department staff have conducted noise monitoring at the boat drags at Lake Ming on April 6, 1975. Noise level readings were collected at the proposed Rio Bravo subdivision site only, as this site was previously demonstrated to be subject to higher noise levels than the condominium site. Results of this monitoring are as follows:

Date: 4/6/75

Time: 3:26 - 4:26 P.M.

No. of Samples: 3591

L maximum:	83	dB(A)
L_1:	73	dB(A)
L_{10}:	56	dB(A)
L_{50}:	50	dB(A)
L_{90}:	47	dB(A)
L_{99}:	44	dB(A)
L_{eq}:	60.0	dB(A)

Note: dB(A) means decibels, A-weighted, re: 20 micropascals. L_x means the level exceeded X% of the time; L_{eq} means the energy-equivalent level.

In general, the noise environment at the time of the boats drags is dominated by ambient noise characteristics, such as bird songs, wind noise, background traffic noise, etc., except that a new factor, heavy local vehicle traffic, is added. Racing activities are evidenced by characteristically short excursions into higher noise levels, up to 83 dB(A) at the subdivision site. When drag races are not actually being conducted, the observer is conscious only of the increased vehicle traffic noise. These effects are demonstrated by the changes in the noise level statistics as compared to the ambient noise environment. The increases caused by drag boat racing are as follows:

KERN COUNTY '75 MAY 6 PM 1 PLANNING COMMISSION

96-5005

Office Memorandum • KERN COUNTY

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TO : Planning Department
Current Planning Division

DATE: May 5, 1975

FROM : Vernon S. Reichard, Director
Environmental Health Division, Kern County Health Department

SUBJECT: Rio Bravo Tennis Ranch
Preliminary EIR

$L_{maximum}$: 27 dB(A)

L_1: 21 dB(A)

L_{10}: 10 dB(A)

L_{50}: 8 dB(A)

L_{90}: 6 dB(A)

L_{99}: 4 dB(A)

Of these changes, the values noted at the L_{10}, L_{50}, L_{90}, and L_{99} levels are due to traffic noise; the other changes are due to the boat drag racing activities.

Comparing the results of this survey with the NEHA Model Noise Ordinance as before, violations of Sections 5(b), paragraphs (1), (4), and (5) are noted. Specifically, the noise standard was exceeded for 36.083 minutes, by 15 dB(A) for 1.5 minutes, and by 20 dB(A) for 0.916 minutes. Note that the violation of paragraph (1) is chiefly caused by traffic noise.

The results of boat drag racing monitoring thus support our earlier supposition that noise levels emitted by drag boats would be expected to have effects similar to those levels emitted by outboard racing boats, at both the subdivision and condominium sites. The impacts of this noise source would therefore be essentially the same as expected for outboard boat racing, and the possible mitigation measures would be the same. For details of these impacts, refer to our office memorandum of March 20, 1975.

We hope that this information will be useful to your Department in preparing the draft EIR for the Rio Bravo Tennis Ranch project. Please feel free to contact this office if you should have any questions.

VSR:JB:lb

KERN COUNTY
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96-5005

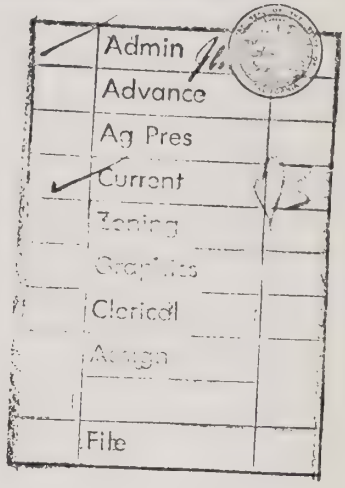
STATE OF CALIFORNIA—RESOURCES AGENCY

Edmund G. Brown Jr.
~~RONALD REAGAN~~, Governor

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD—
CENTRAL VALLEY REGION

SAN JOAQUIN WATERSHED BRANCH OFFICE:
3374 EAST SHIELDS AVENUE
[redacted]
FRESNO, CALIFORNIA~~93723~~ 39726
PHONE: (209) 488-5116

'75 MAR 13 AM 11:03



11 March 1975

PLANNING
COMMISSION

Kern County Planning Commission
1103 Golden State Avenue
Bakersfield, CA 93301

Gentlemen:

We have reviewed the Preliminary Draft EIR for the Rio Bravo Ranch.

The report indicates that waste discharge requirements have been adopted for the project. Waste Discharge Order No. 74-222 adopted on 22 March 1974 regulates the discharge from the existing Tennis Club and the proposed lodge and restaurant. This order does not include the proposed condominium site or residential subdivision.

Section 13260 of the California Water Code requires that for discharges which may affect the State's waters, a completed Report of Waste Discharge be submitted with an appropriate filing fee, not less than 120 days prior to any change in the location, volume, or character of the discharge.

Due to the absence of an adequate discussion of the factors involved in waste disposal in the EIR, it will also be necessary for the developer to submit a detailed technical report concerning all waste disposal activities and addressing at least the following:

1. Exact Location of Waste Discharge: Provide a plot plan showing the exact locations of the discharge points.

2. Volume of Waste Discharge: State the volume of waste discharged and any expected daily or seasonal variations in volume.

3. Waste Characteristics: Describe the waste discharge with regard to amounts and types of various materials present. Include parameters indicating waste strength and treatability characteristics.

4. Method of Treatment and Disposal: Provide detailed plans of the design of septic tanks and percolation systems.

5. Groundwater: Provide information on quality of and depth to local groundwater.

6. Soils: Results of percolation tests and logs of depth and type of soils to a depth of at least 5 feet below the invert of leaching pits or bottom of seepage pits.

By copy of this letter we are advising the developer of his responsibility to comply with the Water Code. After receipt of his Report of Waste Discharge, filing fee, and technical report, we will formulate tentative Waste Discharge Requirements for the Board's consideration.

If you have any questions, please contact us.

Sincerely,

JAMES A. ROBERTSON
Executive Officer

Darrell J. Smith

By: Darrell J. Smith
Senior Engineer
San Joaquin Watershed

Enclosure

cc: Kern County Health Department

Rickett, Ward & Delmarter
2901 "H" Street
Bakersfield, CA 93301

Attention: Charles Karoly

Office Memorandum • KERN COUNTY

TO : Planning Department
EIR Department

DATE: May 30, 1975

FROM : Public Works Department
Environmental Section

SUBJECT: Preliminary Draft EIR – Rio Bravo Ranch

We have reviewed the Preliminary Draft EIR and we have no comments at this time; however, we have attached comments from our staff Engineering Geologist.

JFK/HR/vl
Attachment

C 96-5004

Office Memorandum • KERN COUNTY

TO : Environmental Section
Public Works Department

DATE: May 23, 1975

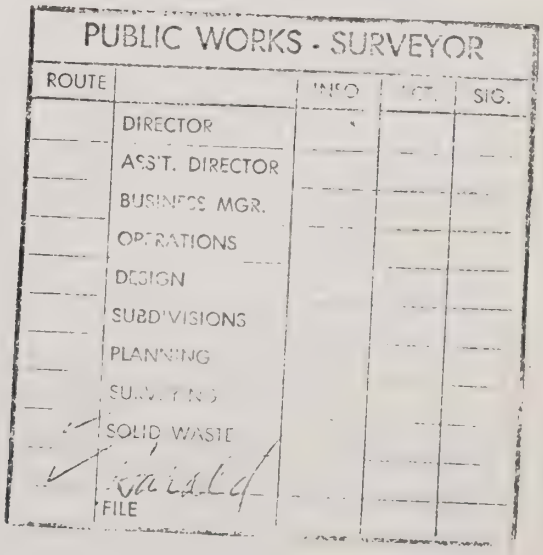
FROM : Lyle Timberlake, Engineering Geologist

SUBJECT: Preliminary EIR, Rio Bravo Ranch Area.

I am enclosing an Epicenter Map showing the seismic activity from 1934 to 1961. From a table by Schnabel and Seed[1], the average value for maximum accelerations in rock for an M = 6.6 earthquake 6 miles away would be 0.42 g.

Kern County's Seismic Hazard Atlas does not agree with Mr. Feders geologic map. The extension of the Round Mountain Fault is listed in the Atlas Legend as a surface fault, inferred, exact location unknown. If this is a surface fault in Quaternary Sediments, I would assume it to be a potentially active fault. Since this fault transverses the residential subdivision, it could be an impact.

1. Schnabel, P.B. and Seed, H.B., Accelerations in Rock for Earthquakes in the Western United States, Bulletin Seismological Society of America, Volume 63, No. 2, April 1973.



96-5005



EPICENTER MAP 1934-61

From Calif. Dept. Water Res. Bull. 116-2

EARTHQUAKE EPICENTERS

SYMBOL	MAGNITUDE	SYMBOL	MAGNITUDE
○	4.0–4.4	□	6.0–6.9
⊕	4.5–4.9	⬡	7.0–7.9
△	5.0–5.4	☆	8.0–8.4
⚠	5.5–5.9		

FOR EARTHQUAKES OF MAGNITUDE 6.0 AND GREATER DATE OF OCCURRENCE AND MAGNITUDE ARE SHOWN

(7.7) JULY 21, 1952

0 2 4 6 8 10

MILES

TELEPHONE
(805) 327-1486

2901 H STREET
BAKERSFIELD, CALIFORNIA 93301

KERN COUNTY

'75 MAR 20 PM 2:37

PLANNING
COMMISSION

CIVIL ENGINEERS
RICKETT, WARD & DELMARTER
2901 H STREET BAKERSFIELD, CALIFORNIA 327-1486
SURVEYORS

File #9933

March 17, 1975

Graphics

Assign

File

Kern County Planning Commission
1103 Golden State Highway
Bakersfield, Ca. 93301

Attention: Teree Lee Hartt,
Principal Planner

Subject: Rio Bravo Tennis Ranch Development

Gentlemen:

We are submitting for your review the following information for the Rio Bravo Tennis Ranch Development:

1. Application for adoption of a Specific Plan.
2. Site Plan.
3. Land Use Plan.
4. Circulation Plan.
5. Open Space & Recreation Plan.
6. Informational outline concerning the Specific Plan.

Very truly yours,

RICKETT, WARD & DELMARTER

Charles Karoly

Charles Karoly

ck:lmn
enc.

AN INFORMATIONAL OUTLINE FOR THE SPECIFIC PLAN OF THE RIO BRAVO TENNIS RANCH DEVELOPMENT

A. LOCATION.

1. South of Lake Ming, north of Alfred Harrell Highway.

2. Legal Description:

   All those portions of the South one-half of Sections 4 & 3, T. 29 S., R. 29 E., M.D.M., lying northerly of the northerly boundary of Alfred Harrell Highway, County Road No. 2263, and lying southerly and westerly of the southerly and westerly boundaries of County Road No. 711 and 711A.

B. LAND USE.

1. Population, density and ratios.

   a. The estimated permanent population is 920 people.

   b. The population density is 6 to 7 persons per acre.

   c. The ratio of dwelling unit types:

Category	Density	No. D.U.'s	Ratio by D.U.'s	Area Acres	Ratio by Area
Condominiums	High	200	70%	57	49%
Subdivision	Med.	80	28%	50	43%
	Low	4	2%	10	8%
		284	100%	117	100%

   d. All residential units will be single family.

2. Educational.

   a. Schools serving the area are in the Bakersfield City School District and the Kern High School District.

   b. The estimated school age population is:

Elementary	80	students
Junior High	80	"
High School	100	"
College	100	"
Total	360	students

c. The following City schools could serve the area:

School	Grades	Remarks
Eissler Elementary	K-6	
Chipman Jr. High	7-8	
Hort Elementary	K-6	Alternate
Compton Jr. High	7-8	Alternate

d. The closest high school is Foothill. The other high school near the area is Highland.

e. Bakersfield College and Cal State Bakersfield also serve the area.

3. Police.

a. The area is policed by the Kern County Sheriff's Dept.

b. The Kern County Park area is policed by Park Rangers.

c. Access to the condominiums and the subdivision will be controlled by entrance gates and an officer or attendant on duty.

4. Fire.

a. Fire protection is provided by the Kern County Fire Dept. out of stations as listed:

Fire Station	Distance According to Fire Department	Time - Alarm to Arrive on Scene	Remarks
#42 Niles St.	7.5 miles	10-12 min.	Most likely Station to respond.
#43 La Cresta	8.5-9 mi.	12-14 min.	Station for backup.
#45 Edison	9.5 mi.	14-16 min.	Probably would not be used to answer fire call.
#41 Virginia Colony	10 mi.	14-16 min.	Station for backup.

5. Waste Disposal.

a. Waste disposal will be by underground systems consisting of septic tanks and leaching pits.

b. The medium density residential subdivision will have individual units for each dwelling unit.

c. The high density residential condominiums will have larger systems that serve groups of dwelling units.

d. The systems will be maintained by the Olcese Water District.

6. Medical.

a. The nearest major medical facility is Kern General Hospital.

b. Private ambulances serve the area - Flinn Ambulance has a station at Mt. Vernon and Oregon Streets in Bakersfield.

c. The Kern County Fire Department also provides limited emergency services.

d. Medical and dental services are located in Bakersfield.

7. Utilities.

a. Water service by Olcese Water District - supply, treatment plant, storage and transmission mains already installed.

b. Electrical service by Pacific Gas & Electric Co.

c. Gas service by Pacific Gas & Electric Co.

d. Telephone service by Pacific Telephone.

8. Government.

a. County offices are located in downtown Bakersfield at the Civic Center.

9. Religious.

a. Churches are located at various locations in Bakersfield.

10. Recreational.

a. Within project.

(1) The Tennis Club is located on a 20-acre site within the project. It provides a clubhouse, tennis courts and a swimming pool. Future facilities planned are a tennis lodge facility, more tennis courts and a restaurant.

(2) Ultimate facilities will consist of:

Pro Shop
Clubroom
Administration Building
Locker Rooms
Swimming Pool
32 Tennis Courts
106-Unit Tennis Lodge
100-Seat Restaurant

b. Adjacent Facilities:

18-Hole Golf Course (County of Kern)
Lake Ming
Group Picnic Grounds
Recreational Vehicle Campground
Picnic Grounds

11. Standards & Regulations.

a. Minimum lot size = 15,000 sq. ft.

b. Setbacks generally are:

25' front yard, 5' side yard except 10' for side yard on streets and 5' rear yard.

c. Bulk for the condominiums will be single- and two-story units in clusters of 2, 3 & 4 units.

d. Height will be limited to two stories.

e. Location of structures will be as shown on the site plan.

f. Construction and occupancy standards will conform to the Kern County Building Code and other local and state ordinances and laws as applicable.

g. Single-family homes will be constructed under architectural design controls yet to be adopted.

C. CIRCULATION.

1. Traffic - Projected traffic information is given below:

Road Location	ADT		Peak Month ADT		Peak Hour	
	Exist.	Ult.	Exist.	Ult.	Exist.	Ult.
Lake Ming @ Alfred Harrell Hwy.	850	3050	1470	4770	425	925
Alfred Harrell Hwy., Westerly	1000	2100	1500	3150	260	525
Alfred Harrell Hwy., Easterly	530	1630	800	2450	140	400

2. Street Standards.

Streets in the tennis club are 30 feet wide. It is contemplated that streets in the subdivision will be 36 feet wide and in the condominiums 30 feet wide. Adequate off-street parking in the condominiums will be provided to compensate for the lack of on-street parking. Streets will be of all-weather construction consisting of asphalt concrete surfacing and aggregate base. Appropriate street drainage facilities will be provided including curbs and gutters, cross gutters and culverts. Grades and layout will conform to County Standards. Minimum radius of curvature will be 200 feet and maximum grade 10%.

3. Street rights-of-way in the subdivision will be 60 feet. Right-of-way widths for Lake Ming Road and Alfred Harrell Highway vary and are as shown on the site plan.

4. Utility easements and drainage easements will be provided as necessary.

5. The streets will be privately owned and maintained by the Property Owners' Associations - one for the condominiums and one for the subdivision.

D. OPEN SPACE & RECREATION.

1. Recreation will be provided by the tennis club and lodge facility which includes:

   100-Seat Restaurant
   Tennis Clubhouse
   Swimming Pool
   32 Tennis Courts
   106-Unit Tennis Lodge

   The main emphasis will be on tennis and adequate tennis facilities are provided. The tennis lodge is for out-of-town adult guests attending tennis clinics at the tennis club.

2. There are no open space lands as such proposed within the development.

3. The proximate location of the Kern River Park, including Lake Ming, the Golf Course, Campgrounds and Picnic Grounds, provide adequate open space in the area of the development.

April 23, 1975

Pacific Gas & Electric Company
1918 H Street
Bakersfield, CA 93304

Attn: Mr. Bozarth

Re: Maps of Existing Electrical Transmission and Gas Lines Serving Lake Ming Area

Gentlemen:

Our department is writing an Environmental Impact Report for a subdivision and condominium development adjacent to the Rio Bravo Tennis Ranch in the Lake Ming area. We would appreciate it if you could furnish us maps showing the existing electrical transmission and gas lines, and capacities of these facilities that would serve this subject area.

Also, we would appreciate amounts of electricity and natural gas consumed per residential dwelling in the Bakersfield Urban area during 1974.

If there are any questions concerning the above requests, please feel free to contact our department.

Very truly yours,

JACK L. DALTON
Planning Director

By
ALEX E. ESPARZA
Junior Planner

clc

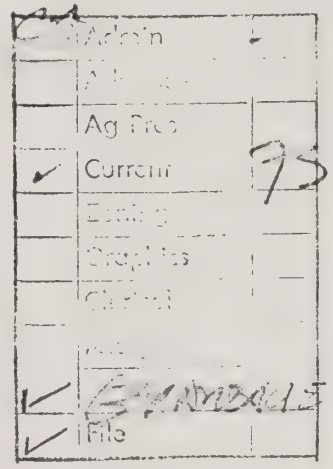
PACIFIC GAS AND ELECTRIC COMPANY

PG&E — 1918 H STREET · P.O. BIN 319 · BAKERSFIELD, CALIFORNIA 93302 · (805) 327-9561

'75 MAY 7 AM 10:12

May 6, 1975

PLANNING
COMMISSION



Mr. Jack L. Dalton, Planning Director
Kern County Planning Commission
1103 Golden State Avenue
Bakersfield, California 93301

Attention: Mr. Alex E. Esparza
Junior Planner

Dear Mr. Dalton:

This is in reference to your recent letter concerning the availability of our services in the Lake Ming area.

Enclosed is a copy of our electrical distribution facilities. We have 12 kv primary distribution capable of supplying about 1,500 kva. We have no gas facilities at the present time in this area. The nearest gas facilities are approximately seven miles away. The estimated average usage of our urban customers is 850 kilowatt hours per month for electric service and approximately 83 therms of natural gas per customer per month.

Natural gas and electrical service is supplied to customers in accordance with our rates, rules and regulations on file with the California Public Utilities Commission at the time request for service is made.

If you have any further questions concerning this matter, please feel free to contact this office any time.

Sincerely,

O. H. Thornall
Kern District Manager

Enclosure

April 23, 1975 DEIR

Rickett, Ward, and Delmarter
2901 H Street
Bakersfield, CA 93301

Re: Draft Environmental Impact Report (EIR) for a 200-unit Condominium Development and a 80-lot Single-Family Residential Subdivision in the Lake Ming Area

Gentlemen:

As you know, this department is preparing the Draft EIR for the subject matter, and, pursuant to Section 15085(a) of the State EIR Guidelines, the document must reflect the independent judgement of this department. Accordingly, as part of the Socio-Economic portion of this report, we would appreciate information concerning the following questions:

1. What are the typical labor requirements for each phase of this development by craft - i.e., carpenters, cement finishers, electricians, etc.- and expected manhours for each craft?

2. What are the estimated material requirements for construction of this project, i.e., concrete, steel, piping, etc., by proposed use?

3. What will be the additional regional income from construction of this project? Include estimated construction and maintenance forces, annual payroll, and cost of local material purchases by category.

If there are any questions about this request for additional information, please feel free to contact our department.

Very truly yours,

JACK L. DALTON, Planning Director

By
ALEX E. ESPARZA, Junior Planner

clc

April 29, 1975

DRAFT EIR
Rio Bravo Development.

Rickett, Ward & Delmarter
2901 H Street
Bakersfield, CA 93301

Attn: Mr. Charles Hardy

Re: Draft Environmental Impact Report (EIR),
Rio Bravo Development, Lake Ming Area.

Gentlemen:

As you know, this department is preparing the Draft EIR for this subject matter; pursuant to Section 15085 (a) of the State EIR Guidelines, the document must reflect the independent judgment of this department. Accordingly, as a part of the project description, we would appreciate information concerning capital costs as described in the enclosure.

Very truly yours,

JACK L. DALTON
Planning Director

By: Alex E. Esparza
Junior Planner

dh

Encl:

TELEPHONE
(805) 327-1486

2901 H STREET
BAKERSFIELD, CALIFORNIA 93301

KERN COUNTY

'75 MAY 1 AM 11:3

PLANNING
COMMISSION

RICKETT, WARD & DELMARTER
2901 H STREET BAKERSFIELD, CALIFORNIA 327-1486
CIVIL ENGINEERS SURVEYORS
SOILS FOUNDATIONS HYDRAULICS STRUCTURAL SANITATION PROPERTY LINES LAND LEVELING SUBDIVISION DRAFTING AERIAL

File #9933

Admin
Advance
Zoning
Cleared
Grants
File

April 29, 1975

Kern County Planning Commission
1103 Golden State Avenue
Bakersfield, Ca. 93301

Attention: Mr. Alex E. Esparza
Junior Planner

Subject: Your letter request of 4-23-75 on Socio-Economic information for Draft Environmental Impact Report - Rio Bravo Tennis Ranch Development.

Gentlemen:

In answer to your questions, we provide the following information. This information was developed from preliminary cost estimates using the available layout data for the Development and is believed sufficiently accurate for the purpose intended.

1. The typical labor requirements for the development are estimated as follows:

Condominiums - 200 Dwelling Units

Category	Estimated Man Hours of Labor
Building Grading	7,000
Building Concrete Work	21,000
Building Masonry Work	21,000
Building Carpentry	79,000
Building Cabinetry/Millwork	57,000
Building Heating, Air Conditioning & Plumbing	57,000
Building Electrical	21,000
Building Painting	21,000
Building Plastering	29,000
Building Roofing	21,000
Building Floor Coverings	7,000
Building Sitework	15,000
Building Administration	44,000
Sub-Total - Building - 200 units	400,000 Man Hours

Category	Estimated Man Hours of Labor	
General Site Grading	4,000	
Street Construction	5,000	
Site Water System	4,000	
Site Drainage	1,000	
Site Utilities	2,000	
Site Landscaping	3,000	
Site Administration	1,000	
Sub-Total - Site Improvements	20,000	Man Hours
Total =	420,000	Man Hours
=	2,100	Man Hours/Unit

Subdivision - 80 Dwelling Units

Category	Estimated Man Hours of Labor	
Building Grading	3,000	
Building Concrete Work	9,000	
Building Masonry	9,000	
Building Carpentry	31,000	
Building Cabinetry/Millwork	23,000	
Building Heating, Air Conditioning & Plumbing	23,000	
Building Electrical	9,000	
Building Painting	9,000	
Building Plastering	11,000	
Building Roofing	9,000	
Building Floor Coverings	3,000	
Building Sitework	5,000	
Building Administration	16,000	
Sub-Total - Building - 80 Units	160,000	Man Hours
General Tract Grading	1,000	
Street Construction	4,000	
Tract Water System	2,000	
Tract Drainage	1,000	
Tract Utilities	1,500	
Tract Administration	500	
Sub-Total - Tract Work	10,000	Man Hours
Total =	170,000	Man Hours
=	2,100	Man Hours/Unit

2. The estimated material requirements for the project, valued in dollars, are:

Building Work	
Sand & Gravel	$1,100,000
Portland Cement	120,000
Wood	2,000,000
Metal Products	1,200,000
Paint	120,000
Floor Coverings	360,000
Appliances	240,000
Miscellaneous	120,000
	$5,260,000

Condominium Site & Tract Improvements	
Sand & Gravel	$ 79,000
Portland Cement	5,000
Asphalt	16,000
Water Pipe & Fittings	74,000
Drainage Culverts	13,000
Utilities Materials	40,000
Landscape Materials	33,000
	$ 260,000
Total	$5,520,000

3. The estimated additional regional income from construction of the project is as follows:

a.	Construction Forces		$7,000,000
b.	Local Materials		
	(1) Sand & Gravel	$1,179,000	
	(2) Lumber Products	1,000,000	
	(3) Paint	120,000	
	(4) Asphalt	16,000	
			2,315,000
	Total Income from Construction		$9,315,000
c.	The estimated annual maintenance payroll		$ 780,000/Yr.

Notes: Concerning b. above, the only truly locally produced materials would be sand and gravel and asphalt. Lumber products would be purchased locally, but wood is not necessarily a local material. Paint may be manufactured locally or elsewhere.

Concerning c. above, the estimated labor force is:

Tennis Club	25 employees
Tennis Lodge	10 employees
Public Restaurant	25 employees
Security	8 employees
Maintenance	10 employees
Total	78 employees

78 at $10,000/yr. = $780,000

4. A Capital Cost Breakdown, as requested by phone, follows:

Condominiums & Subdivision Dwelling Units

Building Grading	$ 120,000
Concrete	840,000
Masonry	720,000
Carpentry	2,160,000
Cabinetry/Millwork	1,680,000
Heating, Air Conditioning & Plumbing	1,800,000
Electrical	600,000
Painting	480,000
Plastering	840,000
Roofing	600,000
Floor Coverings	480,000
Miscellaneous Sitework	600,000
Appliances	240,000
Administration	840,000
Sub-Total - Dwelling Units	$12,000,000

Site & Tract Work

Grading	$ 100,000
Street Construction	260,000
Water Systems	200,000
Drainage	40,000
Utilities	110,000
Landscaping	70,000
Administration	20,000
	$ 800,000
Total Capital Cost	$12,800,000
Average Cost per Dwelling Unit	$ 45,700

We hope that this information will aid you in the preparation of the Socio-Economic portion of the Draft EIR for the Project.

Very truly yours,

RICKETT, WARD & DELMARTER

Charles Karoly

Charles Karoly

ck:lmn

TO: Kern County Planning Comm.
1103 Golden State Avenue
Bakersfield, Ca. 93301

Attn: Alex E. Esparza

FROM: RICKETT, WARD & DELMARTER
~~RICKETT, REAVES & WARD~~
2901 H STREET
BAKERSFIELD, CALIF. 93301
Phone: 327-1486

SUBJECT: DRAFT EIR, Rio Bravo Development
Lake Ming Area

DATE: 5-7-75

JOB NO. 9933

Referring to your letter of April 29, 1975, we enclose herewith: "Capital Cost Summary, Housing Facilities".

RICKETT, WARD & DELMARTER

Mahmoud Bakri

Mahmoud Bakri

mb:lmn

enc. 1

cc: Mr. Ken Ramsey
Rio Bravo Tennis Ranch
P. O. Box 9128
Bakersfield, Ca. 93309
w/enc.

Admin
Assign
File

KERN COUNTY
'75 MAY 8 AM 11:54
PLANNING COMMISSION

SIGNED

TABLE

CAPITAL COST SUMMARY
HOUSING FACILITIES

Account Title	Subdivision (80 UNITS)	1st Phase Condominiums (42 UNITS)	2nd Phase Condominiums (65 UNITS)	3rd Phase Condominiums (93 UNITS)
1. Housing Structures	3,428,400	1,800,000	2,785,770	3,985,794
2. Sewage Disposal	120,000	63,000	97,500	139,500
3. Landscaping	86,000	44,900	69,600	99,500
4. Streets, Sidewalks, Curbs, and Gutters	135,700	31,500	48,800	69,800
5. Community Service Conduits				
a. Gas	20100	5300	8200	11,700
b. Electricity	36800	9700	15,000	21,500
c. Water	5600	23100	35,700	51,200
d. Telephone	—	—	—	—
6. Construction Facilities Equipment	—	—	—	—
7. Engineering and Construction management	194,000	98900	153,000	218,900
8. Other Costs including contingency, environmental studies, sales taxes and transportation	116,500	59,300	91,800	131,400
9. Interest during construction	116,500	59,300	91,800	131,400
10. Total Cost	4,310,000	2,195,000	3,397,170	4,860,694
11. Cost Housing Unit	53,875	52,262	52,264	52,266

* Applicant estimate

32a

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. 75-194

WASTE DISCHARGE REQUIREMENTS
FOR
RIO BRAVO TENNIS CLUB AND GUEST LODGE FACILITY
RIO BRAVO DEVELOPMENT COMPANY
KERN COUNTY

The California Regional Water Quality Control Board, Central Valley Region, (hereinafter Board), finds:

1. Rio Bravo Development Company, (hereinafter Discharger) located in the SE 1/4 of Section 4, T29S, R29E, MDB&M filed a Report of Waste Discharge dated 29 April 1975.

2. The discharger presently discharges 11,000 gpd of domestic sewage and restaurant wastes to an existing septic tank, seepage pit disposal system (Discharge 001). This discharge is presently governed by Order No. 74-224, adopted on 23 January 1974.

3. The discharger proposes to construct guest lodge facilities in three phases for their tennis club and to discharge 6,000 gpd of domestic sewage (Discharge 002) from the first phase.

4. A separate septic tank and seepage pit facility will be constructed for the treatment and disposal of Discharge 002. The design of this system is unique and deviates from established standard practices.

5. The discharger proposes to utilize a 12,000 gallon, three compartment septic tank. Final disposal will be to a series of 24 seepage pits 18 inches in diameter and approximately 40 feet deep. Each pit will contain a central vertical four inch diameter perforated discharge pipe. The entire annular space in each pit will be gravel packed.

6. The beneficial uses of areal ground water are:

   a. agricultural supply
   b. domestic supply
   c. irrigation supply

7. The beneficial uses of Lake Ming are:

   a. recreation, including water contact sports
   b. preservation and enhancement of fish and wildlife
   c. esthetic enjoyment

8. The California Regional Water Quality Control Board, Central Valley Region, adopted a Water Quality Control Plan for the Tulare Lake Subbasin on 25 July 1975.

9. The Board has notified the discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for the discharge and has provided them with an opportunity to submit their written views and comments.

10. The Board, in a public meeting, has heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED, the Discharger shall comply with the following:

A. Waste Discharge Specifications

1. Neither the treatment nor the discharges shall cause a nuisance or pollution as defined by the California Water Code.

2. The discharges shall remain underground at all times.

3. The average daily discharge from Discharge 001 shall not exceed 11,000 gpd.

4. The average daily discharge from Discharge 002 shall not exceed 6,000 gpd.

5. There shall be no bypass or overflow of untreated or partially treated waste.

6. The discharges shall not cause a degradation of any water supply.

7. There shall be no discharge to surface waters or to surface water drainage courses.

B. Provisions

1. Order No. 74-224, adopted on 23 January 1974, is hereby rescinded.

2. The discharger shall comply with the Monitoring and Reporting Program No. 75-194 as specified by the Executive Officer.

3. The discharger shall report to the Board any material change or proposed change in the character, location, or volume of the discharge.

4. A copy of these waste discharge requirements shall be maintained at the treatment facility and be available at all times to system operating personnel.

5. The requirements prescribed herein do not authorize the commission of any act causing injury to the property of another, nor protect the discharger from his liabilities under Federal, State, or local laws, nor guarantee the discharger a capacity right in the receiving waters.

6. In the event of any change in control or ownership of this treatment and disposal system, the discharger shall notify this Board of such change and notify the succeeding owner or operator of the existence of this Order.

7. The Board will review this Order periodically and may revise the requirements when necessary.

I, JAMES A. ROBERTSON, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on AUG 22 1975.

Original signed by
James A. Robertson

JAMES A. ROBERTSON, Executive Officer

8/8/75 Revised LSO/em

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. 75-194

FOR
RIO BRAVO TENNIS CLUB AND GUEST LODGE FACILITY
RIO BRAVO DEVELOPMENT COMPANY
KERN COUNTY

MONITORING

The discharger shall provide a report on a semiannual basis detailing system performance. Where there are physical provisions for monitoring of system components and flows, facilities shall be monitored routinely. Daily readings of water usage and wastewater flows shall be made and recorded. The septic tank and seepage pits shall be inspected periodically and maintained as necessary to insure optimum performance. Dates of inspections and maintenance performed shall be recorded.

REPORTING

The discharger shall implement this monitoring program within 15 days of the effective date of this order.

Semiannual monitoring reports shall be submitted to the Regional Board by the 1st of January and the 1st of July of each year.

The data shall be summarized in such a manner to illustrate clearly the compliance with waste discharge requirements.

Ordered by: Original signed by
James A. Robertson
JAMES A. ROBERTSON, Executive Officer

8/8/75 Revised LSO/em

AUG 22 1975

RIO BRAVO TENNIS CLUB AND GUEST LODGE FACILITY
RIO BRAVO DEVELOPMENT COMPANY
KERN COUNTY

Rio Bravo Ranch Development Company proposes to develop guest lodge facilities in three construction phases for their tennis club located in the SE 1/4 of Section 4, T29S, R29E, MDB&M. The site is located approximately 0.3 miles south of Lake Ming and Kern River State Park.

The discharger presently discharges approximately 11,000 gpd of domestic sewage and restaurant wastes (Discharge 001) to an existing treatment facility consisting of a septic tank and seepage pits. Discharge 001 is governed by Waste Discharge Requirements, Order No. 74-224, which will be rescinded upon adoption of this Order.

The discharger proposes to discharge approximately 6,000 gpd of domestic sewage (Discharge 002) emanating from the Construction of Stage I of the guest lodge facilities. The new treatment and disposal facility for Discharge 002 will consist of a 12,000 gallon septic tank with a unique seepage pit system.

The discharger proposes to construct 24 seepage pits, 18 inches in diameter and approximately 40 feet deep. Each pit will contain a central vertical four inch diameter perforated discharge pipe extending to the bottom of the pit. The pits will be backfilled with 1/2 inch gravel.

The pits will be constructed in a line with the distribution box centrally located and the capability to discharge sewage equally from the center towards the ends. The discharger proposes to utilize a similiar disposal system for construction of phases II and III provided this system proves to be more efficient than a conventional system.

Water supply for the existing and proposed facilities will be provided by Olcese Water District.

Average annual rainfall in the area is approximately 10 inches, and the average evaporation rate is about 70 inches.

Ground water depth is estimated to be greater than 100 feet. Beneficial uses of Lake Ming are recreation, including water contact sports; preservation and enhancement of fish and wildlife; and esthetic enjoyment. Land surface elevation is about 600 feet.

The soils in this area are of the Cajon-Tujunga association and the Cajon-Calhi association. These soils are coarse to moderately fine textured alluvial soils. Limitation rating to septic tank filter fields are slight to moderate, respectively.

A Draft Environmental Impact Report was reviewed for this project and comments were provided to the State Clearing House on 1 August 1975.

Waste discharge requirements have been formulated for Discharges 001 and 002 to prevent pollution and nuisance and insure protection of the State's waters.



RIO BRAVO TENNIS CLUB AND GUEST LODGE FACILITY
RIO BRAVO DEVELOPMENT COMPANY

SE 1/4 of Sec. 4, T29S, R29E, MDB&M.
Oil Center and Rio Bravo Ranch
7 1/2 Min. US.S.G.S. Quad Kern County

KERN COUNTY HEALTH DEPARTMENT

1700 Flower Street
P. O. Box 997
Bakersfield, California-93302
Telephone 861-3636

OWEN A. KEARNS, M.D., M.P.
Health Officer

IV - D - 13

TEMPORARY

WATER SUPPLY PERMIT

After an investigation, as provided for in Section 4014 of the Health and Safety Code, it has been determined that the provisions of the Health and Safety Code with respect to supplying water for domestic use can be met by the water system described below. Permit

to supply water: Kern River water treated by a coagulant, four (4) 60 inch by 14 ft. pressure sand filters, 1 - 33,000 gal detention tank, 1 - 330, 000

from *(sources and works)*: gal storage tank with pre and post chlorination located in Sec. 3, T29S, R29E, Kern County, Calif.

to *(communities or area)*: proposed Rio Bravo Tennis Ranch, 1 - 240 unit condominium, 1 - 250 parcel sub-division located south of Kern River State Park near Bksfd. Calif.

is granted to *(owner of system)*: Olcese Water District, George W. Nickel, President
110 New Stine Road, Bakersfield, Calif. 93309

This permit is granted subject to the following provisions:

(1) Water for domestic purposes shall, under all circumstances and conditions, be pure, wholesome, and potable, and shall not endanger the lives or health of human beings;

(2) A program for the protection of the domestic water system against possible backflow from premises having dual or unsafe water systems shall be maintained in accordance with the *Cross-Connection Regulations* of the California State Board of Public Health;

(3) Competent and adequate operation shall be provided at all times; and operating records, including water flow, quantity of water treated, chemicals used, and other data as may be required by the State Department of Public Health, shall be maintained;

(4) Bacteriological and chemical tests performed in compliance with the methods set forth in the *Public Health Service Drinking Water Standards* of 1962, shall be made in accordance with the requirements of the State Department of Public Health, or the health officer having jurisdiction;

(5) Necessary treatment works or improvements in operation, maintenance or construction, shall be provided when needed or when required by the State Department of Public Health;

(6) Modifications, additions, or changes in the distribution system shall comply in all particulars with the provisions of Section 4011.6 of the Health and Safety Code.

(7) Prior to any construction on the proposed water system, a clearance from the Planning Commission Office shall be obtained.

(8) This Temporary Permit is issued for a period of one year to allow time for construction and to meet all applicable regulations.

(9) This Temporary Permit shall be subject to review on or before June 20, 1975.

OWENS A. KEARNS, M.D., Health Officer

By Vernon L Richard

Title Director, Environmental Health Division

June 18, 1974
Date Issued

Permit No. 527

KCHD #333-S (Rev. 3-74)

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

SUMMARY AND FINDINGS OF WATER PERMIT APPLICATION INVESTIGATION

(Small Water Systems)

Olcese Water District
110 New Stine Road
Bakersfield, Calif. 93309
George W. Nickel, President

Date 6-18-74

Water system
(Place and Owner)

(1) Appraisal of Sanitary Hazards and Safeguards

This system will have coagulation, filtration, pre and post chlorination and retention.
System eventually to serve a 240 unit condominium and approximately a 250 parcel sub-division.
Source is the water from Kern River.

(2) Conclusions and Recommendations

Recommend that application be approved and a Temporary Permit issued.

(3) Special Permit Provisions *(if necessary)*

This Permit is issued subject to items 1 through 9 as stated on the Water Supply Permit.

(7) Prior to any construction on the proposed water system, a clearance from the Planning Commission Office shall be obtained.
(8) This Permit is issued for a period of one year to allow time for construction and to meet all applicable regulations.
(9) This Permit shall be subject to review on or before June 20, 1975.

By George Stramiello R.S.

Title Environmental Health Specialist

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH
(3-14-30)
FORM SE-212

KERN COUNTY HEALTH DEPARTMENT

1700 Flower Street
P. O. Box 997
Bakersfield, California-93302
Telephone 325-5051

OWEN A. KEARNS, M.D., M.P.H.
Director of Public Health
Air Pollution Control Officer

CERTIFIED COPY OF RESOLUTION

[To accompany application on Form A3]

"Resolved by the board of directors of Olcese Water District
Name of Corporation

California Water District
a~~Corporation~~, that pursuant and subject to all of the terms, conditions and provisions of Division 5, Part 1, Chapter 7, Sections 4010 to 4035 of the California Health and Safety Code and all amendments thereto, relating to domestic water supplies, application by this corporation be made to the State Board of Public Health, for a permit to Construct Olcese Water Treatment Plant to serve lands in Section 3, 4, and 10, Township 29 South, Range 29 East, M.D.B.&M., South of Kern River State Park, including Rio Bravo Tennis Ranch. Water to be treated will be pumped from Kern River through pressure sand filters to a 330,000 gallon storage tank, then to service area,
Applicant must state specifically what is being applied for—whether to construct new works, to use existing works, to make alterations or additions in works or sources and state nature of improvement in works. Enumerate definitely source or sources of supply, kind of works used or considered (if known) and specify the locality to be served. Additional sheets may be attached.

that the President and Secretary X of this corporation be and he is hereby duly authorized and directed to cause the necessary data to be prepared and investigations to be made; and that the President and Secretary of this corporation be and they are hereby duly authorized, in its name and as its act and deed, to sign and file with said State Board of Public Health the proper application."
Title of officer

The foregoing is a true copy of a resolution adopted by the board of directors of the said corporation on the 18th X day of April X, 1974 X, and has not been revoked.

[AFFIX CORPORATE SEAL HERE]

Secretary of said Olcese Water District
Name of ~~Corporation~~

KCHD #373-EH (5-70)

KERN COUNTY HEALTH DEPARTMENT

1700 Flower Street
P. O. Box 997
Bakersfield, California-93302
Telephone 325-5051

OWEN A. KEARNS, M.D., M.P.H.
Director of Public Health
Air Pollution Control Officer

Application from OLCESE WATER DISTRICT

Name of applicant, and if not an individual, a statement as to whether partnership or corporation.

Pursuant and subject to all of the terms, conditions and provisions of Division 5, Part 1, Chapter 7, Sections 4010 to 4035 of the California Health and Safety Code and all amendments thereto, relating to domestic water supplies, application is hereby made to said State Board of Public Health for a permit to Construct Olcese Water Treatment Plant to serve lands in Section 3, 4, and 10, Township 29 South, Range 29 East, M.D.B.&M., South of Kern River State Park, including Rio Bravo Tennis Ranch. Water to be treated will be pumped from Kern River through pressure sand filters to a 330,000 gallon storage tank, then to service area.

Applicant must state specifically what is being applied for—whether to construct new works, to use existing works, to make alterations or additions in works or sources and state nature of improvement in works. Enumerate definitely source or sources of supply, kind of works used or considered (if known) and specify the locality to be served.

Additional sheets may be attached.

Dated June 12, 1974.

Olcese Water District
110 New Stine Road
Bakersfield, California 93309

Post-office address

[IF BY CORPORATION, CORPORATE SEAL HERE]

NOTES

If this application is made by a corporation, it must be signed in the name of the corporation by its duly accredited officer or officers.
If this application is made by a partnership, all of the members must sign.
If this application is made by more than one individual, all must sign.
In all cases the post-office address of the applicant must be given and the execution of the application must be acknowledged before a Notary Public.

KERN COUNTY HEALTH DEPARTMENT

1700 Flower Street
P. O. Box 997
Bakersfield, California-93302
Telephone 325-5051

OWEN A. KEARNS, M.D., M.P.H.
Director of Public Health
Air Pollution Control Officer

CERTIFIED COPY OF RESOLUTION

[To accompany application on Form A3]

"Resolved by the board of directors of Olcese Water District
Name of Corporation
California Water District
a ~~corporation~~ that pursuant and subject to all of the terms, conditions and provisions of Division 5, Part 1, Chapter 7, Sections 4010 to 4035 of the California Health and Safety Code and all amendments thereto, relating to domestic water supplies, application by this corporation be made to the State Board of Public Health, for a permit to Construct Olcese Water Treatment Plant to serve lands in Section 3, 4, and 10, Township 29 South, Range 29 East, M.D.B.&M., South of Kern River State Park, including Rio Bravo Tennis Ranch. Water to be treated will be pumped from Kern River through pressure sand filters to a 330,000 gallon storage tank, then to service area,

Applicant must state specifically what is being applied for—whether to construct new works, to use existing works, to make alterations or additions in works or sources and state nature of improvement in works. Enumerate definitely source or sources of supply, kind of works used or considered (if known) and specify the locality to be served. Additional sheets may be attached.

that the _____ of this corporation be and he is hereby duly authorized and
Title of officer
directed to cause the necessary data to be prepared and investigations to be made; and that the President and Secretary of this corporation be and they are hereby duly authorized, in its name and as its act and deed, to sign and file with said State Board of Public Health the proper application."

The foregoing is a true copy of a resolution adopted by the board of directors of the said corporation on the _____ day of _____, 19____, and has not been revoked.

_____

Secretary of said Olcese Water District
Name of Corporation

AFFIX CORPORATE SEAL HERE

KCHD #373-EM (5-70)

DEPARTMENT OF PUBLIC HEALTH

INFORMATION TO ACCOMPANY APPLICATION FOR WATER SUPPLY PERMIT

(Small Water Systems)

Date June 12, 1974

(1) Community or Area Served Olcese Water District (Submit map if available) County Kern

(2) Name of Water System

Owner Olcese Water District

Owner's Address 110 New Stine Road - Bakersfield - California - 93309

(3) Local Representative George W. Nickel (Name) President (Title)

Address 110 New Stine Road - Bakersfield - California - 93309

(4) Principal Features of System

(a) Source of Supply Kern River in Section 3, Township 29 South, Range 29 East, M.D.B.&M. approximately one fourth mile South of Kern River State Park. (Give brief description and location)

(b) Treatment Works 4 Barrel Pressure Sand Filters, 60 inch diameter x 14 feet long. Gas chlorinated and chemical coagulant treated prior to filtration.

(c) Pumping Stations 2 - 700 gpm, 20 HP pumps at Kern River Inlet 2 - 700 gpm, 50 HP booster pumps to reservoir.

(d) Reservoirs 1 - 33,000 gallon detention tank downstream of filters, 1 - 330,000 gallon storage tank located 3,000 feet from treatment plant.

(e) Distribution System 12" and 10" Class 150 and 200 ACP pipeline between treatment plant and reservoir. 12" Class 150 ACP pipeline from Reservoir to Rio Bravo.

FORM 228-211

(5) Auxiliary Supplies NONE
(Source and character, frequency of use)

(6) Back-Flow Hazard NONE
(To premises having unapproved supplies; program, regulation for controlling back-flow hazard)

(7) Emergency Provisions 330,000 gallon storage tank.
(For furnishing water during floods, earthquakes, power interruptions and water shortages)

(8) Operating Records NONE
(Indicate nature and frequency of readings)

(9) Laboratory Tests NONE
(Laboratory making tests, nature of tests and summary of recent tests)

(10) System Data

Year	Population Served	No. of Active Connections	No. of Metered Services	% Metered	Water Used Avg. Day	Water Used Max. Day
1940						
1950						
195__						
195__						

Safe maximum production capacity of supply 1,000,000 gals. per day

By [signature]

Title Consulting Civil Engineer

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH
16816-490 3-48 3M OSP
FORM 220-211
(REV. 3-48)

DEPARTMENT OF PUBLIC HEALTH

RESERVOIR *(Use for all distribution storage, chlorine contact tanks, sand traps, etc.)*

(1) Place and Owner: Olcese Water District

(2) Source of Information: Ricks, Taylor & Associates, Inc.

Collected by: M. Taylor Date June 12, 1974

(3) Number or Name	Detention Tank	Storage Reservoir
Date constructed:	August 1974	August 1974
Purpose (storage, sand trap, etc.):	Detention	Storage
Capacity:	33,000 gallon	330,000 gallon
(4) Location: *(specific)*	Treatment Plant	3000' downstream
Neighborhood:		from Treatment Plant
Size of lot:		
Fencing:	None	None
(5) Construction:		
Material:		
Sides:	Steel	Steel
Floor:	Steel	Steel
Cover or roof:	Steel	Steel
Height top of walls above ground:	12 Feet	24 Feet
Surface drainage to reservoir possible?	No	No
Ventilation:	Roof Vent	Roof Vent
Screening:	Galv Screen	Galv Screen
(6) Inlet and Outlet Arrangement:		
Inlet:		
Location:	Top-side of tank	Bottom-side of tank
Distance above bottom:	11 Feet	1 Foot
Outlet:	17' ÷ @ 45°	45' ± @ 127°
Distance from inlet:		
Distance above bottom:	1 Foot	1 Foot
Drain to where:	Percolation Pond	Natural Channel
Overflow to where:	None	Natural Channel
Sewer or other hazardous connection (if so, make sketch on back)	None	None
(7) Relation to System:		
Receives from:	Treatment Plant	Floating on Distributio
Delivers to:	Distribution System	System
(8) Defects and Remarks: (Include statements on cleaning practices, condition of structure—particularly of roof, dimensions and shape of reservoir, leakage, kind and location of access openings, protection against insects, birds and rodents.)		

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH
84324—30 11-48 14 ⓒ OSP
(REV. 7-1-32)
FORM SE-1333

STATE OF CALIFORNIA

DEPARTMENT OF PUBLIC HEALTH

DISTRIBUTION DATA

(1) Place and Owner: Olcese Water District

(2) Source of Information: Ricks, Taylor & Associates, Inc.
Collected by: M. Taylor. Date: June 12, 1974

(3) Materials:
Mains: Asbestos Cement
Condition: New
Lead, copper, brass (*extent*):
Joints:

(4) Distance of Mains from Sewers: None existing, 12' Minimum
(*Past practice, future policy*)

(5) Disinfection (*method*):
New Mains: AWWA
After Repairs: AWWA

(6) Infiltration Hazard: None
(*Relationship to ground water table, underwater lines, etc.*)

(7) Pressure Range: 40 - 55 psi

(8) Cross-Connection and Backflow Prevention:
Private supplies (*kind and extent*): None
Cross-Connections:
With Other Potable and Supervision: None
With Non-Potable, if so, What Protection: None
Plumbing Code or Regulations:

(9) Dead Ends (*extent*): None
Growths and Sludge in Mains:
Flushing:

(10) Defects and Remarks:

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH
FORM 455-138

CHLORINATION DATA

(1) Place and Owner: Olcese Water District

(2) Source of Information: Ricks, Taylor & Associates, Inc.
Collected by: M. Taylor Date: June 12, 1974

(3) Application:
Water treated *(raw, filtered, etc.)*: Raw
Chlorine demand character:
Point of application: 10" Inlet line
Mixing: Orifice Plate
Contact time before use: 30 minutes minimum
Contact time before residual test: 30 minutes minimum
Water flow variation: Constant
How measured: 10" Propeller meter

(4) Machine:
Make: Wallace & Tiernan Model V-75 with auto switch over
Type: Gas Chlorinater
Capacity: 50 Lbs. per day
Condition: New
Holds setting well?

(5) Housing:
Insulation: Steel prefabricated and insulated 24' x 30' building
Heating: None

(6) Chemical Added *(% available chlorine, form)*: Gas
Cylinder or crock capacity: 2 - 150 Lb cylinders
Stock on hand:

(7) Operation and Maintenance:
Lapse during changes:
Lapse during repairs:
Spare parts on hand:
Ability to make repairs:
Visits to machine:
When or how often:
Distance to travel:
Other duties:
Residual Tests:
Tests made *(O.T., O.T.A., etc.)*:
Tester used:
How often:
Where test made:
Results *(indicate free or combined)*:
Records:

(8) Condition of Scales *(if any)*: New

(9) Complaints:

(10) Defects and Remarks:

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH
(1-31-50)
FORM SE-1381

DEPARTMENT OF PUBLIC HEALTH

FILTER PLANT DATA

(1) Place and Owner: Olcese Water District

(2) Source of Information: Ricks, Taylor & Associates, Inc.

Collected by: M. Taylor Date: June 12, 1974

(3) Year Operation Began: New Plant

(4) Flow, How Measured, Variations: 700 gpm, 10" Propeller meter - Constant

(5) Filters:
Type: Horizontal pressure sand filters
Number: 4
Size: 60" Dia. x 14'-0"
Rate Controllers: 2 - 700 gpm pumps
Rate of Filtration: 2.5 gpm/SF
Loss of Head Gauges: Inlet and outlet gages

(6) Pre-Treatment:
Aeration: None
Plain Sedimentation *(capacity)*: None
Flocculation *(capacity)*: 700 gpm
Coagulation-Sedimentation *(capacity)*: 700 gpm
Chemicals used:

(7) Post-Treatment:
Chemicals used: Chlorine

(8) Chlorine Contact *(capacity in minutes)*: 30 minutes minimum

(9) Clear Well *(capacity in gallons)*: 33,000 gallons

(10) Laboratory Control:

(11) Operators *(when on duty. Licensed or not)*:

(12) Water:
From: Kern River
Sent to: Rio Bravo Tennis Ranch & Olcese Water District

Wash Water:
What determines time or interval of backwashing? Time clock or pressure differential
Source: Multiplex filters supply own backwash water
Drain to: Percolation reservoirs
Percent used: One per cent
Rate of backwash: 700 gpm

(13) Defects and Remarks:

TELEPHONE
(805) 327-1486

2901 H STREET
BAKERSFIELD, CALIFORNIA 93301

CIVIL ENGINEERS
RICKETT, WARD & DELMARTER
2901 H STREET BAKERSFIELD, CALIFORNIA 327-1486
SURVEYORS

File #9933 √

IV-D-8(SUPPL.)

February 25, 1975

Kern County Health Department
P. O. Box 997
Bakersfield, Ca. 93302

Attention: Mr. Art Richards

Subject: Rio Bravo Tennis Ranch Development

Gentlemen:

We are transmitting a copy of a letter report received from Dr. Winneberger dated 2-19-75 concerning the use of septic tanks and seepage pits for the disposal of sewage effluent from the project. Copies of References 8, 9, 13, 14, 18, 19, 20, 22, 23 & 24 are available in our offices for review as desired. A copy of Reference 15 is enclosed.

We comment additionally as follows:

Orlob's Formula (page 3 - Winneberger)

$$L = 107\ dV$$

Using an effective size of the medium as a medium coarse sand (as found in the bottom of the test hole drilled at the Tennis Club site), d = #40 sieve = .42 mm = .042 cm, then:

$L = 107 \times .042 \times 1$ ft./day
$L = 4.49$ ft. (the distance in feet that the wastewater must percolate to become equal to drinking water - bacteria-wise).

Winneberger's Reference 15 by R. C. Cooper, Ph.D., cites examples of field and laboratory tests on the efficiency of the soil mantle in the removal and inactivation of microbial pathogens. It cites 99.99 percent coliform removal in 12 feet or less of soil.

One study cited was 99.90 percent removal of coliform count in Oakley sand (.020 mm effective size) at a depth of three to five feet. Another study cited removals of 99.95 percent coliforms in 15 feet of sand with an effective size of .04 cm.

Considering that conventional sewage treatment plant criteria require 90% to 95% BOD removals, removals of better than 99% by soils can be termed excellent treatment.

For this project, where:

Distance from bottom of seepage pits to ground water = 60 feet (traveling unsaturated medium), and

Average distance of horizontal travel from seepage pits to the Kern River = 1000 feet (travel in saturated medium).

Then: Winneberger's Reports and references indicate that these distances would be more than adequate to safeguard the underground water supply and the Kern River from pollution from the proposed septic tanks and seepage pits.

Very truly yours,

RICKETT, WARD & DELMARTER

Charles Karoly

ck:lmn
enc.

cc: Ken Ramsey
Rio Bravo Tennis Ranch
P. O. Box 9128
Bakersfield, Ca. 93309

John Timothy Winneberger, Ph.D.
1018 Hearst Avenue
Berkeley, Ca. 94710
(w/o enc.)

JOHN TIMOTHY WINNEBERGER, PH.D.
Consultant, Septic-Tank Systems

1018 Hearst Avenue, Berkeley, California 94710
Telephone (415) 549-1355

19 February 1975

IV-D-8 (SUPPL.)

Mr. Charles Karoly
Rickett, Ward & Delmarter
2901 H Street
Bakersfield, California 93301

Re: Rio Bravo Condominiums

Dear Mr. Karoly,

You are now preparing an Environmental Impact Report for Rio Bravo Condominiums and my input on some questions has been requested. Here are some data and opinions which I hope are helpful. Let me know if further elaboration is needed, or if other questions need considerations.

ULTIMATE DISPOSITION OF EFFLUENT PERCOLATING FROM SUBSURFACE DISPOSAL FIELDS

Geologic Considerations[1,2,3,4]

The site is over 1,000 feet from the Kern River and it is approximately 100-feet higher than the river in elevation. The Kern River is over a stratum of Round Mountain Silt, which is relatively impermeable and appears to dip gently toward the river. The development site has alluvium of 100-feet deep, which would be expected to be a porous medium without open fractures or such underground channels. There always exists a possibility of the presence of a gravel formation without sands or other finer materials; such would not offer adequate filtration of effluent. Still, the possibility of such an open gravel stratum traversing 1,000 feet between the site and the river is believed remote.

It would be reasonable to assume that effluent would become a part of the ground waters perched on Round Mountain silt. This would offer perhaps, at least, half of a hundred feet of downward percolation from 40-ft. deep pits. Lateral percolation would necessarily be over 1,000 feet before entering the body of the Kern River.

Wastewater Treatment Considerations

Septic Tank: A septic tank of good design can remove about three-fourths of suspended solids input; about two-fifths of COD; about half of BOD; and roughly 20 to 40 percent of nitrogen and phosphorus input[5,6,7,8,9].

Disposal Field: A soils system can remove about all suspended solids input; about all COD, BOD; about all phosphorus; and about all nitrogen input. Behavior of nitrogen is still more a part of botanical disciplines than engineering[8,10]. It might be of interest to note that properly functioning subsurface disposal fields remove from wastewaters, virtually all of a detergent builder -- trisodium carboxymethyloxysuccinate[11]. In similar studies of another detergent builder, the sodium salt of nitrilotriacetic acid (NTA), virtually all was degraded in a properly functioning septic-tank system[12,13].

Pathogens: Chances of pathogens reaching the Kern River are remote indeed, and chances of disease transmission by such a route are even more remote[14,15].

Orlob's Formula: Orlob used experimental data to provide a formula, from which movement of bacteria through a porous medium could be predicted[16]. That formula was simplified

into a practical form[17]. It is $L = 107\,dV$, where "L" is the distance in feet, wastewater must percolate to become equal to drinking water (bacteriawise); "d" is the effective size of the porous medium in centimeters; and, "V" is the velocity of flow. Assuming the velocity of groundwater flow over Round Mountain silt is 1-ft. per day and L is 1,000 ft., use of Orlob's formula leads to an effective size of over 9 centimeters (3.7 inches). That would be a large particle indeed. Obviously, the distance of travel is so great as to render Orlob's formula "off scale" in estimates. This emphasizes that chances of bacteria reaching the Kern River by underground routes are remote. The same kind of argument could be offered on the basis of Romero's work[18].

THOUGHTS ON SURFACE DISPOSAL

Treatment

Secondary treatment and disinfection would certainly be a normal management (not proposed for Rio Bravo) of any wastewater intended for surface disposal. Unfortunately, injection of air accomplishes maximum distribution of microbes (pathogens too) to the human environment. Passing air in the activated sludge process (extended aeration, etc.) causes formation of bubbles. Maximum formation of bubbles is a design intent. Microbes are highly concentrated into these bubbles and then dispersed into the atmosphere in aerosols[19]. This would occur before disinfection, which would interfere with the secondary treatment process.

The above remarks describe a known mechanism for introducing sewage-borne microbes into the human environment. That it does indeed occur, has been demonstrated[20].

It obviously follows that spray irrigation would be improved by disinfection, but only inasmuch as disinfection would be thorough. Unfortunately, it is known that disinfection cannot be expected to be thorough[15,21].

Reliability

Evidence mounts that customary sewage treatment is inadequate[21]. Even popularized literature carries the story[22],

> *"Because conventional sewage treatment plants have never worked well, no one at EPA truly expects them to work. And because no one expects them to work, no one demands cost and performance guarantees from sanitary engineers. The feedback mechanism here is perfect, but it is also perfectly absurd."*

On one occasion, E. T. Jensen, operations chief in the water quality control office of the EPA told an American Society of Civil Engineers National Specialty Conference at Los Angeles,

> *"I am ashamed to admit that ... the old 'pros' in the field of water pollution control appear to be lagging."*

Other remarks along that general line of thought were further offered[23].

A Trend

Man has three choices of practical wastewater disposal: water courses, the surface of land, and the subsurface.

Recent years have seen discouragement of use of water courses for disposal. The obvious reason is that we are incapable of discharging waters clean enough. That leaves land. Sewage ponds large enough to infiltrate and evaporate all wastewaters input are sometimes attempted, but reliably large systems are uncommonly expensive. Spray irrigation is sometimes economical, but health hazards must one day be addressed. It would seem apparent, that subsurface systems offer a lot. They are still in disrepute because of historic mismanagement and almost total ignorance of their design on the part of professional engineers. Nevertheless, if the present trend to manage wastewaters in the most environmentally sound fashion as is possible continues, subsurface disposal must become a greater part of professional thinking. Such is now beginning.

WORSHIP OF BIGNESS

Anyone acquainted with American thought is not surprised to notice grandiose dams, highways, megalopolises, and gigantic sewerage facilities. After all, Paul Bunyan was a hero for clearing entire forests in a single day. Americans have always worshipped almost any large anything. Even Al Capone was secretly admired by many law abiding citizens -- Napoleon, openly so.

In California, Los Angeles testifies to man's worship of bigness, and his tendency to herd with his fellows. Of course, this megalopolis requires massive facilities. The wisdom of facilities constructed to help Los Angeles grow about eight millions more in population (aqueduct) has been questioned. Nace remarked[24]:

> *"....it seems premature even to discuss modification of continental plumbing systems in order to encourage the descent of human locust hordes on the southwestern United States..."*

Nace further offered:

> *"Three besetting sins tempt the planners and their advisers in a world in which science and technology are major forces, in which size has been a common principal measure of importance and in which the landscape generally has been regarded only as something to be altered. These three besetting sins are faith in science and technology, worship of bigness, and arrogance towards the landscape."*

One Collection System or Several?

Warshall remarked,

> *"The inability of man to recycle wastes for the benefit of all living creatures is called pollution."*[25]

Warshall's remark and Nace's remarks, point out that gathering wastes together would, in most situations, be unwise. Gathering something together that must ultimately be spread out seems obviously doing things the hard way. Clearly, current trends to create large sewer systems in preference to methods of managing smaller volumes nearer to their sources are more a matter of philosophy than objective sense. Gathering more wastes centralizes management, but increases the magnitude of the problem. Slight upsets affect the total system. On the other hand, gathering wastes into groups of smaller volumes increases management demands (more emotionally than really), but the magnitude of each problem is smaller. Moreover, upsets are less consequential.

Whether the Rio Bravo development has a central collection system or has a group of systems, is a matter of philosophy, and philosophies are matters of personal preferences.

PERMANENCE OF MANAGEMENT

Nothing man constructs lasts forever. Even nature's creations are forever changing. Thus, whatever wastewater treatment and disposal facilities serve the Rio Bravo development, will need care and repair.

Subsurface Disposal Fields

The longevity of a subsurface disposal field depends on its size (related to input volumes) and its management.

Laak[26] in personal communications and public meetings has asserted that disposal fields can be designed to last indefinitely. He refers to single fields, not periodically rested. Winneberger agrees, but has promoted the concept of alternation of fields as a step toward practical permanency. These apparently conflicting technical approaches have their basis in assumed size of the disposal field. Nevertheless, both researchers agree that disposal fields could serve indefinitely -- it is only a matter of size and management. After all, wouldn't a disposal trench traversing a contour from Bakersfield to New York last the Rio Bravo development indefinitely?

In a report to Rickett, Ward & Delmarter[27], management was discussed and recommendations offered. Those recommendations were intended to yield wastewater disposal practices for permanency. Alternation of fields was not extensively discussed there. Such could be accomplished by providing alternate distribution pipes leading to each end of the row of disposal pits. A major point of recommendations was an ongoing program of study, intended to guide final design.

Again, it is emphasized that no man-made device survives indefinitely without maintenance and intelligent judgment from time to time. It was in the recommended maintenance program rather than devices, that permanency was to be accomplished.

Respectfully submitted,

John Timothy Winneberger, Ph.D.

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Waste Water Management and Infectious Disease

Part II: Impact of Waste Water Treatment

IV-D-8 (SUPPL.)

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{See especially P. 345 & following}

In a previous article,[1] the disease agents and indicator organisms associated with water and waste water were discussed. Included in that discussion were considerations of the presence of infectious agents, the host response, host contact, and the dose of the agent. The intent of this review is to examine the efficacy of various water treatment methodologies in reducing the number of pathogens, which is important in understanding what dose is likely to be present in the discharge from these processes.

Treatment methods include conventional treatment (primary and secondary) and advanced treatment which may include chemical precipitation, ponding, filtration, disinfection and often land disposal. It is interesting to know how well these various methods remove or destroy bacterial, parasitical and viral agents.

Removal of Bacterial and Parasitical Disease Agents

In 1959, Kabler[2] wrote an extensive review article concerning the removal of pathogenic microorganisms by sewage treatment processes, including activated sludge and trickling filter methods, anaerobic digestion, and chlorination. In this review he points out that trickling filter treatment reduces the total number of bacteria and coliforms from 70 to 95 percent; salmonella from 84 to 99 percent; and the tubercle bacillus by 66 percent. The activated sludge procedure reduced the total count by 90 to 98 percent, the coliform, salmonella, cholera and shigella by 91 to 99 percent and *Mycobacterium tuberculosis* by 88 percent. Anaerobic digestion removes 25 to 93 percent of the salmonella and 90 to 96 percent of the tubercle bacillus. Chlorination is usually 98 to 99 percent effective.

The same processes removed tapeworm ova, amoebic cysts, hookworm ova, and ova and aquatic stages of schistosomes with a wide range of efficiencies. These vary from 20 to 100 percent, most often depending upon operational parameters in effect at the time of the original report.

The basic mechanisms of purification in operation in waste stabilization ponds is thought not to differ greatly from that in other treatment methods. Total bacterial counts in the effluent of these ponds usually are less than one percent of the original concentration and coliforms are reduced by 59 to 99.9 percent. In one study salmonella were isolated from all phases of an oxidation pond process.[3]

Virus Removal

Although many investigations on enteric virus survival in conventional sewage treatment processes have been reported, many serious gaps still exist in our knowledge of this potential problem. Substantial reduction in the enteric virus density in treated waste water is achieved only if long storage times are employed.[4]

Results of both laboratory and field investigations indicate that primary sedimentation is capable of only slight reductions in enteric virus density. Removals of enteric viruses are generally no more than 40 or 50 percent of the number originally present.[5,6]

There have been no laboratory studies and few field studies on virus reductions through trickling filtration. The few field studies reported indicate that virus removals are not more than 40 or 50 percent.[6,7,8]

Activated sludge has been shown to be the most effective conventional sewage treatment process for reducing the enteric virus density of waste water. Removals of 90 percent or more have been achieved. From the results of laboratory studies, some investigators have suggested that

virus removal in activated sludge is an adsorption process involving the formation of a stable virus-sludge complex.[5] Other investigators have suggested that virus destruction may be due to a two-step process involving aeration in the presence of sludge floc and nutrients followed by settling of the floc.[6] Kelly and her coworkers also reported that biological antagonism in the sludge may play a role because they were able to isolate several bacteria from activated sludge which had antiviral activity. These authors also concluded that virus removal in activated sludge is probably by adsorption on the sludge particles. Biological factors were also believed to play a role in virus removal. The subsequent fate of sludge-associated virus was not determined. In several field studies on virus survival in activated sludge, it was found that enteric viruses were present 4 to 10 times less frequently in the activated sludge effluent than in the influent.[9,10,11]

Only a few studies on enteric virus removal in stabilization ponds have been reported. Virus reduction in a stabilization pond has been studied at the Santee Water Reclamation Project in Southern California where sewage is treated to a high degree and the reclaimed water is used for recreational lakes.[12] One of the stages in the reclamation process is a facultative stabilization pond with a 30-day detention time. From July, 1962, to October, 1965, virus studies were conducted and a summary of the findings indicates that the percentage of samples positive for virus was 97 percent in the pond influent and 19 percent in the pond effluent.

Malherbe and Strickland-Cholmley[8] did extensive studies on virus removal in both pilot and full-scale ponds. Poliovirus type 2 was seeded over a period of 20 days into a one-half acre model stabilization pond system treating raw sewage and consisting of four ponds in series. In samples taken 20 times over a period of 56 days, no appreciable reduction of virus was observed beyond that expected from dilution. Studies with full-scale ponds utilized two different municipal pond systems. In one pond system where virus survival was studied for a period of six months, the percent of samples positive for virus was 4.3 percent in the pond influent (trickling filter effluent) and 3.8 percent in the pond effluent. In another pond system the percent of samples positive for virus was 49 percent in the pond influent (trickling filter effluent) and 2.5 percent in the effluent over a nine-month period.

The removal of Poliovirus Type 3 in a pilot pond and in effluent taken from a full-scale municipal pond has been studied by Christie.[13] In batch experiments the pilot pond water was capable of reducing the virus concentration by nearly 5 orders of magnitude in 96 hours. The pilot pond experiments are difficult to interpret because the virus added to the pond influent could not always be accounted for, suggesting that virus was destroyed before it reached the pond. Municipal pond effluents were capable of reducing the concentration of added poliovirus by more than 2 orders of magnitude in 72 hours.

The survival of enteric bacteria and viruses has recently been studied in three different stabilization pond systems in New Hampshire.[14] Enteric viruses were isolated from a majority of the pond effluents tested during all seasons of the year. Insufficient data were collected to determine if significant virus reductions occurred in the ponds.

The effect of waste ponding upon enteric viruses has been studied at the Windhoek Wastewater Reclamation Plant in South Africa.[15] The reclamation system includes a series of nine maturation ponds with a detention period of 14 days. In a 48-hour study on virus removal at each stage of the reclamation process, the reduction of enteric virus concentration in the maturation pond series was at least 95 percent.

Removal of Infectious Agents by Advanced Treatment

The two most prominent activities in which advanced waste treatment processes are being employed are the Santee Water Reclamation Project in Southern California and the Windhoek Wastewater Reclamation Plant in South Africa. In the first, waste water is being reclaimed for recreational use, while in the latter it is used to supplement the domestic supply.

The Santee Project consists of primary sedimentation, activated sludge, oxidation ponding, percolation through a natural sand and gravel layer, and chlorination. The final effluent is used for a series of recreational lakes. Bacterial removal by the conventional treatment methods was between 96 and 99 percent effective (See Table I).

Although the percent removal was good, a large number of bacteria still remained and water from the oxidation

TABLE 1
Bacterial Removal in Preliminary Waste Treatment Process, Santee, California[12]

Effluent	% Removal of Influent	
	Coliform	Fecal Coliform
Primary	0	35
Activated Sludge	89	80
Oxidation Pond	96	99

pond was not acceptable for bathing. Infiltration through the gravel layers was still not enough and chlorination prior to discharge was necessary. Results of the bacterial analyses for a six-month period are given in Table II.

The bacteriological quality of the influent to the recreational lake is well within the desirable raw surface water quality criteria for public drinking water supplies. Both the lake inlet and outlet quality were acceptable for primary (swimming) human contact.[16]

The Santee Project was also evaluated for virus removal efficiency. Using the gauze pad method of virus sampling, it was observed that the percentage of samples being positive for virus was 100 percent after primary treatment, 97 percent after detention in an oxidation pond, less than 10 percent after chlorination of pond effluent, 2 percent after percolation, and 0 percent in the recreational lakes over a 33-month period.

The Windhoek Wastewater Reclamation Plant consists of primary sedimentation, trickling filtration, secondary sedimentation, maturation in a series of nine oxidation ponds, aluminum sulfate flocculation/flotation, foam fractionation, secondary lime/aluminum sulfate flocculation, breakpoint chlorination, sand filtration, and activated carbon filtration.

This operation is able to produce a water of acceptable bacteriological quality after breakpoint chlorination is applied. The total bacterial count is significantly reduced by chlorination but increases after the activated carbon filtration, most probably because of bacterial growth in the carbon filters.[17]

At the South African site, initial investigations on the removal of added poliovirus in a pilot scale system showed that reductions of greater than 90 percent could be achieved in each unit process studied and that no virus could be detected at any stage after flocculation/flotation. Using either the polymer two-phase method or the ultrafiltration method of virus concentration, substantial virus reductions in the full-scale reclamation system were found.[15] Although 18 percent of the virus in the influent sewage remained after secondary settling, a further reduction of 95 percent was achieved in the maturation ponds, and no virus could be detected after foam fractionation or any later treatment step. With the concentration methods used, however, only one liter aliquots of waste water effluent samples could be tested for virus.

A number of laboratory studies have been conducted to evaluate the removal of viruses by various coagulation methods to be used in advanced waste water treatment. Removal of viruses from waste water effluents by coagulation and flocculation has been studied in the laboratory by Brunner and Sproul.[18] They found that phosphate precipitation from waste water effluent by calcium and aluminum removed 90 percent or more of added poliovirus. However, Chaudhuri and Engelbrecht found that aluminum sulfate coagulation of bacteriophages T4 and MS2 in waste water effluents removed only about 60 percent and 10 percent respectively of the added virus in laboratory studies.[19] The authors concluded that in this instance high virus

TABLE II
Removal of Coliform and Fecal Coliform During Tertiary Treatment, Santee, California, 1963-1964.[17]

STATION	COLIFORM		FECAL COLIFORM	
	MPN*	%**	MPN	%
Pre Infiltration	330,000	0	130,000	0
Post Infiltration	18	99.995	<2	>99.999
Lake Inlet (Post Chlorination)	<2	99.999	<2	>99.999
Lake Outlet	200	99.939	78	99.940

removal efficiency would not be achieved by coagulation and flocculation of waste water effluent due to the presence of interfering organic matter.

The removal of poliovirus from secondary effluents by lime flocculation and rapid sand filtration has been studied in the laboratory by Berg *et al.*[20] Lime flocculation removed 70 to 99.86 percent of poliovirus, the degree of removal depending upon the concentration of lime and the pH level attained. Virus removal by filtration through eight inches of sand ranged from 82 to greater than 99.8 percent. When lime flocculation was followed by sand filtration, the overall virus removal ranged from 98.6 percent to greater than 99.997 percent. Cooper *et al.*[21] noted that whenever the pH of the lime flocculation process was greater than 11, no virus survival could be detected after three minutes of exposure.

Sproul *et al.*[22] reported low removals of poliovirus in laboratory studies with activated carbon. Poor virus removal was attributed to competition for adsorption sites by organic material in the sewage.

Disinfection

Chlorine is most commonly used for the disinfection of water and waste water. When used properly, it is extremely effective in destroying bacteria, parasites and viruses. The chemical may be added to water either in the form of chlorine gas or as a hypochlorite. In either case it is felt that the unionized HOCl is the most effective disinfectant and, therefore, a pH that favors the existence of this species is desirable. Chlorine also reacts with nitrogenous compounds in such a way that its germicidal effectiveness is greatly reduced. In all cases, therefore, the effectiveness of disinfection will be affected by pH, contact time, temperature and water quality.

Viruses are, as a rule, more resistant to chlorination than are bacteria; therefore, using coliforms as an index of efficiency of chlorination is open to some question. It has been indicated[7] that at pH 6 to 8 a concentration of 0.3 mg/l free available chlorine for 30 minutes is required to remove 99.9 percent of the viruses present in water and a combined chlorine residual of 10 mg/l for more than an hour would be required to cause a similar result. Normally, municipal water supplies are chlorinated in a range of 0.1 to 0.2 mg/l free available chlorine which may not be sufficient for virus removal.

Bauman and Ludwig[23] compiled data from the literature concerning the chlorination of small public supplies of water. They developed a number of death curves for various bacteria, viruses and protozoans as they react to different concentrations of free available chlorine. The slope of these curves was approximately one, and from which these authors gave the following "rule of thumb" formula for water disinfection:

$$C^{-n}t = K \qquad (1)$$

where C is the chlorine concentrations in mg per liter; t is the time required to remove 99 to 100 percent of the organisms present; n is the slope of the death curve and K is a constant. Since n approximates one, the relationship $Ct = K$ would hold in which the product of any concentration of chlorine in mg per liter and contact time in minutes that equals K would be an effective dose. They developed the useful K values shown in Table III.

TABLE III

Value of Disinfection Constant K for Various Important Water-Borne Microorganisms - Temp. 20-29°C[23]

K VALUE	*MICROORGANISMS*
	E. coli pH 7.0 - 8.5
2-4	
	Salmonella pH 7.0
	Poliovirus pH 6.8 - 9.3
6	
	Coxsackie A pH 7 - 9
10	Hepatitis pH 6.4
50-125	*E. histolytica* pH 7 - 8

It can be readily seen that there is a considerable range of differences depending upon the organism of interest. The agent of amoebic dysentery is extremely resistant to disinfection; however, filtration is an effective means of its removal.

The Soil Mantle

The soil mantle is quite efficient in the removal and inactivation of microbial pathogens. Because sewage spreading is a method of promise in the reclamation of waste water, it is important to determine its purification capability. Great numbers of bacteria are removed by percolation through a few feet of fine sand by the process of mechanical and physical-chemical filtration and by the antagonistic effect of soil organisms. Excellent bacteria removals have been reported by passage through a minimum of three to seven feet,

TABLE IV

Soil Texture and Coliform Count at a Depth of Three Feet for Five California Soils Upon Which Sewage Was Spread (Adapted from Orlob and Butler)[26]

NAME	EFFECTIVE SIZE (mm)	FLOW RATE (ft/day)	COLIFORM* (median MPN/ml)
Hesperia Sandy Loam	0.0020	0.23	3.6
Columbia Sandy Loam	0.0033	0.18	2.3
Hanford Sandy Loam	0.0074	0.21	23
Yolo Sandy Loam	0.021	0.23	240
Oakley Sand	0.020	0.21	2400

*Initial coliform count ranged from 2.4×10^6 to 1.1×10^7 per 100 ml.

even though the soil is quite coarse. In this latter study, which included the spreading of raw sewage, a travel depth of 12 feet was required to effect 99.99 percent coliform removal.[24] In all instances of bacterial removal, it is notable that the most pronounced activity is in the top 0.5 to 1.0 cm of soil and that often there is a secondary limiting zone appearing 50 to 60 cm below the surface.[25] The texture of the soil involved also has an effect on the ability to remove bacteria from waste water as is shown in Table IV.

The work done at Santee, California, wherein secondary effluent was infiltrated laterally through 1,500 feet of sand and gravel, indicated most of the removal of bacteria occurred in the first 200 feet. Little further removal was seen in the next 1,300 feet of percolation bed. These data indicate impressive removal of bacteria even by a very coarse medium and also indicate an optimum distance beyond which one obtains diminishing returns in bacterial removal.

A number of laboratory and field studies on virus removal from water and waste water in various types of soil systems have been reported. In a pilot scale study, Robeck[27] reported that two feet of packed sand removed poliovirus from relatively clean water flowing at rates up to four feet per day, but the virus breakthrough occurred when the flow rate was increased. In a laboratory study Hori *et al.*[28] found that at least 97 percent of the poliovirus applied to some Oahu soils was removed at soil thicknesses of 1.5, 2.5 and 6 inches. Other Oahu soil types were considerably less effective in removing virus. Carlson[29] reported that bacteriophage T2 and poliovirus were effectively removed from aqueous salt solutions by adsorption to clay particles. The virus removal efficiency was lower in experiments with natural river waters. Drewry and Eliassen[30] studied bacteriophage removal in both soil columns and batch soil suspensions in salt solutions. They found that virus was removed from the water by adsorption to the soil particles, and they obtained virus removals of greater than 99 percent. At the Santee Water Reclamation Project, oxidation pond effluent was percolated through a 1,500 foot long bed of sand and gravel having a depth of 10 to 12 feet. During a 10-month period the percentage of samples positive for virus was nine percent in the percolation bed influent and two percent in the effluent. When the percolation bed was challenged with a single dose of poliovirus, no virus could be detected in the percolated water after 200 or more feet of travel. In a recent review of bacteria and virus movement through porous media, Romero[31] concluded that soil uniformly composed of fine sand with a high clay content is the best aquifer material for removing biological contaminants and that such contaminants would travel a maximum of 100 feet in this environment.

Table V is a list of selected information concerning movement of microorganisms through soil gained from both laboratory and field experiences. It is by no means complete, but does indicate that although the data available shows a good degree of variation, the soil mantle tends to rather effectively remove bacteria and viruses within a few feet of depth when water is spread on the land surface or leached from a septic tank or from a pit privy.

TABLE V

Penetration or Removal of Microorganisms Through Soil

ORGANISM	TYPE OF STUDY	SOIL TYPE	REMOVAL/PENETRATION	REF.
Coliform	Lab.	Saturated Sand	Penetration < 10 ft at flow rates of 9-24 cm/day	35
E. coli	Lab.	Garden Soil	75% removal through 3 ft column	36
Poliovirus	Lab.	Saturated Sand	90-99.96% removal through 2 ft of sand after 42-105 days. Same removal rate at end of 6 months	35
Coxsackie & Thielers Virus	Lab.	Garden Soil	50% removal through 3 ft soil column	36
Bacteriophage	Lab.	Various Soils	90-95% removal within 1.5 - 1.6 ft of soil column	30
Coliform	Field	Pit Latrine	No penetration > 1 ft down. Addition of 0.4 m^3/day of water increased penetration down to 6.5 ft	37
Coliform	Field	Surface Spreading of 2nd Effluent	60% removal at 3 ft depth in 12 days. 100% removal at 6.5 ft	38
Coliform	Field	Surface Spreading of 2nd Effluent	95% removal at 6.5 ft	39
E. coli	Field	Surface Spreading	Penetrate to 10 ft but not to 20 ft	40
Coliform	Field	Surface Spreading Sandy Loam	Penetration to 2 ft between 3rd and 8th month. >90% removal	41

Injection of waste water into natural aquifers and the effect of such activity upon the microbiological quality of groundwater must certainly be considered. One of the most quoted investigations has been that of McGauhey and Krone[32] in which they attempted to determine the kinetics of bacterial movement in a confined aquifer. At Richmond, California, water containing 6, 10, 20 and 27 percent primary sewage was injected into an aquifer with groundwater flow rates ranging from 0.46×10^{-4} m/sec to 7.12×10^{-3} m/sec. With 27 percent sewage, representing 4.7×10^6 coliforms/100 ml, peak counts of 23/100 ml were observed 30 m distant in the direction of normal groundwater flow. Similar maxima were obtained in other directions at 15 and 19m. Increasing the rate of injection from 85 to 403 $\times 10^{-5}$ m/sec did not result in travel of pollution to a greater extent.

When the logarithm of the number of bacteria remaining at various downstream distances from the point of injection was plotted against distance, a straightline relationship was found to exist. A rough approximation of this relationship may be expressed as

$$N = N_o e^{-\mu l} \qquad (2)$$

in which N_o is the original number of bacteria and N is the number of bacteria found at distance l; μ is defined as the filterability of the system, a physical characteristic of that particular aquifer, and is not a function of pressure gradient and, therefore, not related to groundwater flow velocity. However, its value changes as filtering proceeds due to clogging caused by the accumulation of materials filtered.

It has been pointed out by McGauhey and Krone,[25] Krone,[33] and Krone *et al.*[34] that the removal of suspended materials, including microorganisms, is a phenomenon which depends upon a number of interrelated complex processes. The filtering process is affected by surface straining in which any particle with a diameter greater than that of the pore openings in the filter matrix will be removed. Even if only a portion of the suspended particles are larger than the pore openings, they will accumulate and effectively decrease pore size and strain out even smaller particles. This process will be dominant on a soil surface.

As suspended materials pass through an aquifer, straining as described above will take place and will be accompanied by a process called bridging which occurs when particles 1/5 to 1/14 the diameter of the filter matrix particles bridge the filter medium and bring about further straining activity. Straining in the contact zone of the filter medium takes place in those areas where the contact zone area of the filter particles is less than the diameter of the suspended particle. This straining mechanism is described as being effective but of low capacity. When these zones are "saturated", subsequent suspended material merely channels through the

TABLE VI

Removal of Coliforms by Sedimentation in Saturated Sand of Various Effective Sizes (Adapted from Krone *et al.*) [34]

EFFECTIVE SAND SIZE	μ VALUE	REMOVAL OF COLIFORMS PER TRAVEL DISTANCE (c/c_0)**			
cm		0.5 ft	5.0 ft	10 ft	15 ft
0.11	0.0035	0.949	0.592	0.350	0.207
0.04	0.0169	0.776	0.008	0.006	0.0005
0.019	0.1200	0.165	1.52×10^{-6}	2.3×10^{-10}	3.5×10^{-24}
0.0053	2.000	9.3×10^{-14}	$<1.0 \times 10^{-99}$	$<1.0 \times 10^{-99}$	$<1.0 \times 10^{-99}$

*Flow rate 0.044 to 0.052 cm/sec. = 125-150 FT/DAY
**Final concentration of coliforms/initial concentration.

99.95 removal

remaining voids which are greater than the diameter of the suspended matter.

Sedimentation of particles into the filter matrix pores also takes place according to Stoke's Law. This phenomenon is sensitive to water velocity and to direction (horizontal vs. vertical) of flow. Sedimentation is less effective in the removal of suspended particles than straining but has a high capacity for particle removal. Sorption of suspended materials, particularly viruses and bacteria, should certainly be included as an important aspect of the complex phenomena involved in the removal of biological and chemical agents from groundwater. These adhesive activities depend upon the surface properties of both the filter and suspended particles and can be most effective; thus, the presence of clays in an aquifer will dramatically curtail the movement of viruses and bacteria.

To make a *conservative* estimate of the number of microorganisms transmitted through a relatively coarse medium, Krone feels that sedimentation should be considered the primary mode of action. In this instance, Equation (2) would be applied and μ represents filterability per grain layer by sedimentation.

Table VI was developed from data presented by Krone[34] using μ values for sedimentation in a saturated aquifer. From these values it can readily be seen that travel through a sandy aquifer can effectively remove coliform bacteria. Even in the coarser sand (effective size 0.11 cm), one would estimate that at 100 feet from a percolation field the c/c_0 value would be 2.75×10^{-5} or 99.997 percent removal. Table VII lists recommended safe distances between wells and pollution sources, put forth by the U.S. Public Health Service.[31] From the data available, it would appear that these recommendations are quite reasonable.

TABLE VII

Recommended Minimal Safe Distances Between Domestic Wells and Pollution Sources - USPHS

SOURCE OF POLLUTION	RECOMMENDED DISTANCE (Feet)
Septic Tank	50
Sewer Lines (water tight)	10
Percolation Field	100
Seepage Pit	100
Dry Well	50
Cess Pool	150

Summary

Agents of infectious disease are to be found in waste water; thus, the ability of various treatment processes, both manipulated and natural, to remove these pathogens becomes of paramount importance. The literature concerning the efficiency of removal of these organisms by units of various treatment processes has been reviewed. All indications are that well operated secondary conventional treatment (sedimentation and activated sludge) will remove 90 to 99 percent of the bacteria and viruses entering the system.

The available data on the effectiveness of oxidation ponds is not too consistent, with values ranging from as high as 95 and 99 percent to no appreciable reduction of viruses, and 59 to 99.9 percent reduction of coliform bacteria. Much of this variation is due to methods used by the various investigators, and it is this author's opinion that under proper conditions, ponds will remove viruses and pathogenic bacteria with the same efficiency as conventional treatment methods.

Tertiary waste treatment including chemical coagulation and filtration will remove up to 99.9 percent of the bacteria and viruses entering the system. Disinfection with chlorine can be extremely effective in controlling these agents, provided

the water has received adequate pretreatment, and doses of chemical such that viruses will be significantly reduced.

Thus, if a raw waste water containing 1000 virus units per liter was subjected to primary, secondary, and tertiary treatment followed by chlorination, one might expect 8 to 9 orders of magnitude reduction in virus concentration. In this instance the effluent would be expected, on the average, to contain 1 to 10 virus units per 250,000 gallons of effluent. As stated previously, similar removal efficiencies are reported for coliform bacteria; however, one must keep in mind that much larger initial numbers of organisms are involved and thus the actual numbers of bacteria present in the final effluent would be proportionately larger.

Finally, it has been fairly well established that the soil mantle presents an excellent medium for the removal of microorganisms from waste water. In the case of bacteria, the removal is a function of natural decay, adsorption, sedimentation and filtration. In the case of viruses, adsorption is most likely the prime factor in removal. Thus, in this latter case, such parameters as soil and water pH, clay content of the soil, cation concentration and concentration of soluble organic material in the applied water will have an effect upon removal efficiency. In regard to viruses, more information concerning the impact of the aforementioned parameters will have to be evaluated before we can predict the impact of discharging waste water of various quality into the ground.

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11 November 1974

Mr. Wilbur Rickett
Rickett, Ward & Delmarter
2901 H Street
Bakersfield, California 93301

Dear Sir,

You have requested recommendations for a wastewater disposal system to serve the proposed development of Rio Bravo Condominiums. The development is planned to occur in phases, the first one of which is of immediate concern.

Information was gathered which led to recommendations presented herewith. It is realized that some of the recommendations do not conform to customary practices. Nevertheless, the recommendations are practical and if they seem technically suitable to authorities, avenues are open for approval. Specifically, the recommended disposal pits would constitute an improvement in public safety. Ordinance of Kern County states, "(j) Alternate methods of construction of seepage pits may be approved by the Administrative Authority when providing additional safety for the installers." Also, Sec. 1111(g) of the Uniform Plumbing Code provides, "Nothing contained in this chapter shall be construed to prevent the Administrative Authority from requiring compliance with higher requirements than those contained herein where such higher requirements are essential to maintain a safe and sanitary condition."

Transmitted herewith are recommendations for a wastewater disposal system to serve Phase I of the development of Rio Bravo Condominiums.

Respectfully submitted,

John Timothy Winneberger

John Timothy Winneberger, Ph.D.

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RATIONALE FOR DESIGN
OF A
SUBSURFACE WASTEWATER DISPOSAL SYSTEM
TO SERVE
PHASE I OF RIO BRAVO CONDOMINIUMS
KERN COUNTY, CALIFORNIA

INTRODUCTION

Historically, individual wastewater treatment and disposal systems have been "backyard" affairs. With developing sophistication of government, these backyard practices have become codified in recent years. And, as would be expected, codes are a mixture of rational and irrational requirements. In spite of imperfections, codes have improved practices to certain levels. At the same time, codes restrict improvements beyond those levels, unless of course, governing authorities have interests in reasonable innovations.

Authorities governing wastewater treatment and disposal practices are becoming less inclined to regard our rivers and streams as convenient extensions of our sewer systems. Increased interest in using the assimilative capacity of land must follow. It also follows that masters of the simplistic technology of dumping partially treated sewages into water courses, must develop an attention-deprived technology of land disposal. By the by, it can be predicted the day will come when we will be forced to realize that our wastewaters, minerals, and organic debris, must be placed back into natural cyclic processes.

Development of Rio Bravo Condominiums could offer an opportunity to bring into the field, practical portions of research knowledge. The contemplated project is large enough (about 205 living units) to support special engineering of designs and inspections of constructions.

Permeable soils and subsoils are about 150 feet or more deep, offering a generous third dimension for design considerations. Also, local authorities are inclined to accept rational, practical solutions to problems.

DESIGN OBJECTIVES

At the onset, the following design objectives are set forth:

1. Economy -- this is a measure of savings of energy and other resources;
2. Use of a minimum of land surface -- this would be a better economy of land use;
3. "Least hydraulic radius" -- this is a concept which has not been fully appreciated in design; and,
4. Design experience -- use of one sector of a system is the best guide for the design of the remainder.

PHASE I OF

RIO BRAVO CONDOMINIUMS

The development is planned to occur in phases. Phase I would be the development of 42 units, 3 bedrooms each. Twenty of these units would be located on a pad to be graded to elevation 593-ft., at the southeast portion of the subject area. Twenty-two units would be located adjacent to the first pad, but on a pad graded to elevation 585-ft.

WASTEWATER VOLUMES

The number of bedrooms a living unit has, is commonly believed to be related to the number of persons a living unit would serve. This assumption is known to be erroneous, especially in an affluent society [1,2]. The general plan of the living units at hand would not much encourage large families; rather, it would be expected that many units would serve single persons or childless couples. Some children would be expected, but the experienced judgment of the developers would indicate few sizeable families. Wastewater estimates based on 4 persons per unit would probably prove high. This value will be assumed in a conservative attitude, but it is predicted that 3 persons per living unit will be closer to the actual mean.

Estimates of wastewater volumes must be high enough to account for extreme situations in designing disposal fields for single-family dwellings; but, where wastewaters are collected from many units, mean values are realistic. A value of 67 gallons per capita per day is a realistic mean.

Calculations yield about 11,300 gallons per day as the expected wastewater flow.

In line with Design Objective 4, it is submitted:

Recommendation 1. After Phase I is populated, meter wastewater volumes and relate them to the population.

WASTEWATER TREATMENT

Subsurface disposal fields are known to provide excellent treatment of wastewaters, but lifespans of such fields may be extended about 3-fold by provision of extended, primary treatment, such as septic tanks provide.

Because of ignorance of function of disposal fields, and an inclination to judge effluents from the human point of view, there has been a tendency to consider "package plants" for pretreatment of wastewaters to be disposed to a subsurface system. Package plants are simply miniaturized versions of municipal plants, but without municipal maintenance and relatively predictable incoming wastewater flows. Consequently, package plants, as well as many smaller municipal plants, are known to generally malfunction[3]. Further, researches indicate that aerobic and anaerobic (septic) effluents require equal disposal field capacities for equal performance[4]. Septic tanks are stable devices and are uncomplicated by moving parts. Therefore, a septic-tank seems the best choice as a pretreatment device.

Septic-Tank Capacity

National public health authorities advise that a septic tank of large proportions should have a liquid-holding capacity of 1,125 gallons plus 0.75 of the daily expected volume of wastewater flow[5]. Thus, a septic tank to serve Phase I would have a minimum liquid capacity of 9,600 gallons.

The Uniform Plumbing Code (UPC) offers Table 11-2[6]. There it is asserted that 3,500 gallons of minimum septic-tank capacity should serve 10, "Multiple dwelling units or apartments -- one bedroom each."

Notes to the Table submit, "Extra bedroom, 150 gallons each", and, "Extra dwelling units over 10, 250 gallons each."

According to the UPC, the first 10 units of Phase I would require a septic-tank capacity of 3,500 gallons plus 300 gallons for each unit because of the extra 2 bedrooms over one. Calculations show minimum septic-tank capacity of 6,500 gallons for the first 10 units. The remaining 32 dwelling units at 250 gallons each would require an additional 8,000 gallons of capacity. Altogether, the UPC asserts 14,500 gallons of minimum septic-tank capacity should be offered.

It is not believed that the requirements of the UPC are as meaningful as those of the United States Public Health Service (USPHS). The formula developed by the USPHS was based on research and field experience. Nevertheless, it would be conservative and perhaps proper to follow the UPC and to submit:

> Recommendation 2. Provide a septic tank with a liquid-holding capacity of 14,500 gallons.

Septic-Tank Design

Recommended liquid-holding capacities of tanks could be satisfied by a great variety of geometrical configurations. The usual thoughts are economy of materials and ease of construction. These thoughts have led to stubby rectangular tanks, cylindrical pipes sitting on ends, and even spheres. In spite of formalized knowledge, directing long length to width ratios[7], authorities dealing with the practical world have chosen to set standards accommodating most existing practices.

Unfortunately, most septic tanks are not designed to advantage. Baffles intended to assist sedimentation actually cause short-circuiting. A typical baffle is placed across the direction of flow and offers a small passage way to the next compartment. Liquids passing through the restricted passage way must travel at high velocities, in response to

volumes coming into the tank. More yet, incoming volumes increase the liquid level at the inlet end of the tank, which becomes relieved by a rise at the other end; resonance results. The net result of customary design is passage of some incoming wastewaters directly through the tank and out of it.

Complete departure from custom is not practical and it seems best to follow local practices (the UPC) and deviate only when a particular, identifiable benefit is to be realized. An improved system of baffles would be a recognizeable improvement. Here is offered:

> Recommendation 3. Design a septic tank offering about 14,500 gallons (1,935 cu.ft.) of liquid-holding capacity. Provide for 6-ft. of liquid depth and follow recommendations offered by the UPC for a tank with three compartments. The major, recommended deviation from custom would be placing baffles along the length rather than across the width of the rectangular tank.

WASTEWATER DISPOSAL

General Remarks

In early years, when pressurized water supplies became common, the hole in the ground called a pit privy, was enlarged and it became a cesspool. These holes tended to be rather large in diameter, perhaps a dozen or so feet, and not exceptionally deep, perhaps a dozen feet to the bottom. Construction included some kind of a masonry wall to support the integrity of the hole. Receiving gross solids, it was not practical to gravel-fill cesspools.

When the septic tank was invented by Mouras in France, pretreatment rendered effluents suitable for disposal to gravel-filled pits -- but, of course, the masonry of the cesspool was a habit.

In some of the western of the United States, existing drilling equipment and deep soils made it practical to construct narrower and deeper pits. There, it became convenient to replace hand-set masonry with precast concrete rings. Typically a ring would be 4-feet in diameter, about 3-or 4-feet long, provided with slots or holes for free passage of effluent, and precast such that one could be seated on the other. Although disposal pits occasionally claim human lives and concrete rings are frequently more expensive than gravel fillings would be, there still is a tendency to follow the habit of construction of dangerously large, deep holes in the ground.

Recognizing the need to avoid having workmen inside of deep pits, authorities of Kern County provide for gravel-filling of all but a remaining 10-ft. to 12-ft. of deep pits. A drawing of a "Typical Seepage Pit" is attached. Herein it is pointed out that the last 10-ft. still offer a hazard to lives of persons living around pits.

As the years roll by, concrete in presence of hydrogen sulfide (wastewater produced), loses its strength and ultimately the concrete lid of a pit will collapse. Altogether too frequently, collapse is caused by overhead foot traffic and the pit will claim a victim.

The hazard to human life which a void in the ground constitutes, can be entirely removed by gravel-filling disposal pits to their tops. Further, considerations of hydraulic radius, discussed later, would argue that gravel-filling is a superior design feature.

Hydraulic Radius

Disposal fields have effluent-soil interfaces, where a variety of biological activities soon render the interfaces less permeable than surrounding soils. Thus, disposal fields function mostly in terms of the clogged interface, and ignoring other complications, the function of a disposal field could be viewed as a surface-area controlled phenomenon.

When evaporating water, it is spread out as much as possible to hasten drying. When dissipating heat from an air-cooled engine, as much surface area in fins is provided as is practical. So also, when disposing of effluents to subsurface fields, as much of the effluent-soil interface should be exposed to the effluent as is possible. These thoughts can be expressed in terms of hydraulic radius, for want of a better term. The hydraulic radius of a disposal field is here defined as the liquid-holding capacity (volume) divided by the active infiltration surfaces. Although bottom surfaces function somewhat, the sidewalls are better and only considered practically useful. The foregoing thoughts of surface-controlled phenomena argue that:

> The hydraulic radius of a disposal field should be as small a value as is practical to construct.

Considerations of arithmetic soon disclose that disposal pits should be gravel-filled and have small diameters.

Soil Type

Rickett, Reaves & Ward have conducted studies of soils of Rio Bravo Tennis Ranch[8], and engineering geology for that development has been discussed by Mr. Feder[9]. These studies together with personal communications from Mr. Charles Karoly of Rickett, Ward & Delmarter, lead to the assumption that soils of the nearby Rio Bravo Condominiums could accommodate pits, about 40-ft. deep. Although soils exist in a variety of strata, the soils could be generally regarded as Type 3, this being terminology of the UPC. In accordance with Design Objectives 1 and 4 (Economy and Design Experience), it follows:

> Recommendation 4. Construct pits meeting soil Type 3 considerations; log soil types at the time pits are excavated; and, use experience with the pits to guide designs of other Phases of the development.

Wastewater Loading Rates

The original recommendations of the originator of percolation-test criteria, Henry Ryon, have gone astray. This has come about by unintentional and ill-advised intentional efforts to improve practices. Among many authoritative contradictions are the following:

> The UPC asserts, "Where leaching beds are permitted in lieu of trenches, the area of each bed shall be at least fifty (50) percent greater than the tabular requirements for trenches"[6]. The USPHS asserts that absorption area requirements for trenches and beds should be the same.
>
> The UPC asserts, "Maximum grade of lines ... 6 inches per 100 feet." The USPHS asserts, "...tile distribution lines should be level"[5].
>
> The UPC asserts that 1.11 gallons of wastewater may be spread on each square foot of trench bottom areas, if soils are the least permeable acceptable (Type 5). The USPHS asserts that the maximum wastewater loading rate of 0.6 gallons per square foot can be spread onto bottoms of trenches in the least permeable, acceptable soils (60 min./in.).

Standing on both research and practical field experiences, the writer summarily asserted that the USPHS Manual of Septic-Tank Practice and the UPC were contradictory mixtures of Ryon's original criteria, habits, and what was believed to be true[1]. In an effort to offer recommendations for valid practices based on the percolation test, the writer returned to Ryon's original work and added research information to that work. A table of design criteria based on sidewall areas resulted. Although not an advocate of percolation-test criterion, as such, the writer pointed out that if percolation tests are to guide design practices, Ryon's work should be followed with only variations justified by formalized knowledge.

To point out pertinent disagreements among authorities on loading rates, Table I is offered.

Table I

THREE AUTHORITATIVE REQUIREMENTS FOR LOADING SIDEWALLS OF DISPOSAL PITS

Assumption	Maximum Wastewater Loading Rate, gal./sq.ft./day
UPC Soil Type 3	2.5
USPHS Percolation Rate 10 min/in	1.6
Ryon's Percolation Rate 10 min/in	1.0

Note: It is known that the assumptions are not inter-consistent.

Whereas a septic tank is not enlarged easily and should be somewhat oversized at the onset, disposal fields are easily increased in capacity by construction of additional units. It has been recommended (Recommendation 4, page 8) that observations of the functioning system be made, and that information be used to guide designs serving future phases of development of Rio Bravo Condominiums. Proper judgments should also include augmentation of existing disposal-field capacities, if needed. Assuming recommendations are followed, it is added:

> Recommendation 5. Assume a maximum wastewater loading rate of 2.5 gals./sq.ft./day. After the system is in use, assess the capacity of the field to dispose wastewaters and increase its size, if needed.

Disposal Pits

Customary Pits

In Kern County, design of disposal pits has been formalized -- see attached "Typical Seepage Pit." The dimensions of the pit are set forth,

and one pit might differ from the next only in extent of lower, gravel-filled portions.

Improved Pits

A 18-in. bucket auger is available in Kern County, with which holes can be excavated to 40-ft. depths with relative ease. A practical pit would be 18-in. in diameter, 40-ft. deep, be filled 38-ft. deep with about 1/2" x 1/2" gravel, and have a perforated plastic pipe extending to the bottom.

Comparative Designs

At a wastewater flow of 11,300 gals./day and a maximum loading rate of 2.5 gals./sq.ft./day, the sidewall area of an appropriate system of pits would offer 4,520 sq.ft.

Table II presents a comparison of parameters describing Customary Pits and what has been termed herein, Improved Pits. Table III presents a comparison of systems of each kind of pits. In calculations, porosity of gravel was assumed to be 40% and excavations to be performed in ideal geometry. The number of pits was left at a fraction, and cost estimates were derived from telephone calls to local contractors -- lowest values were used.

TABLE II

COMPARISONS OF INDIVIDUAL PITS

Parameter	Customary Pit	Improved Pit
Sidewall Area	421 sq.ft.	179 sq.ft.
Excavated Volume	394 cu.ft.	67 cu.ft.
Water Holding Capacity	193 cu.ft.	27 cu.ft.
Hydraulic Radius	6 in.	2 in.
Long-term Hazard to Life	yes	no
Rough Cost Estimate	$450	$140

TABLE III

COMPARISONS OF SYSTEMS FOR PHASE I

Parameter	Customary Pit	Improved Pit
Sidewall Areas	4,520	4,520
Number of Pits	10.7	25.2
Excavated Volume	156 cu.yds.	62 cu.yds.
Water Holding Capacity	15,500 gals.	5,100 gals.
Rough Cost Estimate	$5,000/system	$3,500/system
	$120/dwelling unit	$83/dwelling unit

In looking through estimates in Tables II and III, it can be seen that the Improved Pit offers several advantages over the Customary Pit. Systems of Improved Pits would offer sidewall surface areas at about 78¢/sq.ft., while the Customary Pits would cost about $1.07/sq.ft. Excavated volumes of soils from Improved Pits would be only about 40% of soils which would be excavated from Customary Pits -- this implies a savings of gravel resources and a small but real step in conservation. The Improved Pits would better suit Design Objective 1 -- Economy, a measure of savings of energy and other resources. It follows:

> Recommendation 6. Design a disposal-field facility consisting of 25 Improved Pits, with four pits having two extra feet of gravel-filled depths.

Distribution

National authorities assert that serial distribution is superior on slopes and at least equal to parallel distribution on level ground. The UPC provides for both parallel and serial distribution, the only deciding factor being slope of land.

Data describe the futility of efforts intended to achieve parallel distribution -- customary distribution boxes. Serial distribution is demanded on slopes because distribution boxes cause premature failures

of disposal fields[10,11,12,13]. Only where evapotranspiration is an important design factor, is parallel distribution desirable; then, special efforts must be made to achieve parallel distribution. The following seems practical:

> Recommendation 7. Distribute effluents to the system of Improved Pits in serial fashion. This could be achieved by connecting the vertical pipe in each pit to an overhead solid line at a "cross" fitting. Fit the top of the cross with a capped riser to provide an inspection point. The solid pipe should slope down from the septic tank, but it could be approximately level in serving the line of pits.

Spacing of Pits

Theoretically, the pits could be as close together as if sidewalls of a deep, long trench broke, curled inwards, and joined to form cylinders. This spacing would have the centers of adjacent pits of equal diameters separated by a distance equal to half of the circumference of one of the pits. This would be about 2.4 ft. on centers of pits with 1.5 ft. diameters.

Practical considerations would space Improved Pits further apart than theoretical spacing would be. It follows:

> Recommendation 8. Space Improved Pits in accordance with construction needs. That might be a minimum of 6 ft. on centers.

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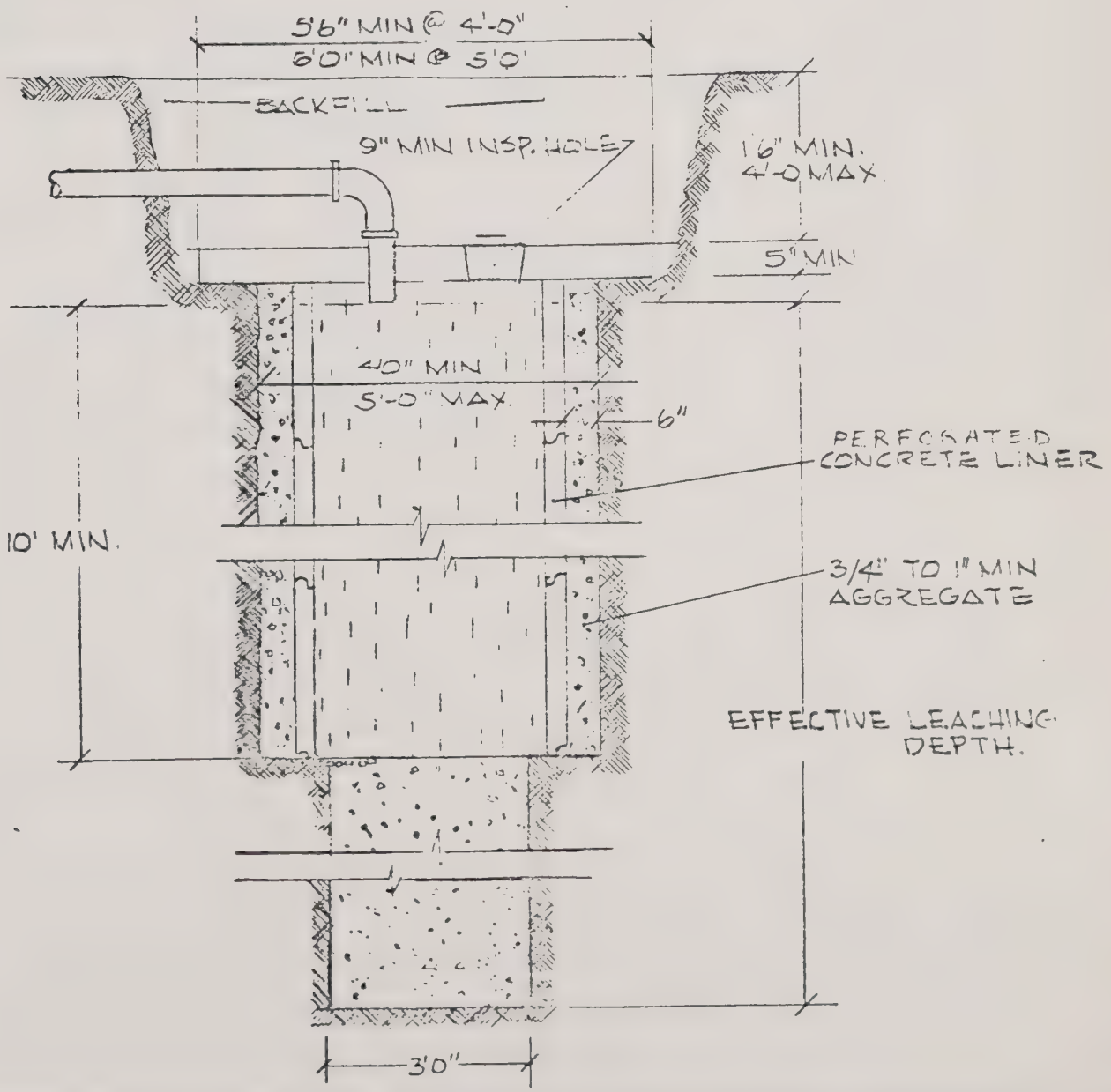
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DRAWING O. S-1 6-11-73 EET 1 of 1	TYPICAL SEEPAGE PIT. DETAIL	KERN COUNTY BUILDING INSPECTION DEPARTME 1101 GOLDEN STATE AVENUE BAKERSFIELD, CALIFORNIA PHONE: (805) 861-2391

ALTERNATE
SEEPAGE PIT.
NOT PERMITTED WHERE MONITORING IS REQUIRED.



KC Bldg. Insp. #121 (7-73)

DEPTH OF PIT WILL BE DETERMINED BY THE TYPE OF SOIL THAT IS FOUND ON THE JOB SITE.

E: The above drawing is intended as a guide for those desiring to prepare their own plans. Because of varying conditions, from one project to the other, details as shown may not meet the requirements of the Building Code. A representative of the Kern County Building Inspection Department will be happy to lend assistance upon request.

JOHN TIMOTHY WINNEBERGER, PH.D.
Consultant, Septic-Tank Systems

1018 Hearst Avenue, Berkeley, California 94710
Telephone (415) 549-1355

8 February 1975

IV-D-8(SUPPL.)

Mr. Charles Karoly
Rickett, Ward & Delmarter
2901 H Street
Bakersfield, California 93301

Re: Rio Bravo Condominiums

Dear Mr. Karoly,

On 6 February 1975, I visited Messrs. Vernon Reichard, Arthur Richards, James Buntin and William Thiessen at the Kern County Department of Environmental Health. The following items were discussed.

MINOR CONCERNS

Septic-Tank Capacity

The Department would permit improved design of a septic tank with longitudinal baffles. It was requested, however, that provisions be made for 24,100 gallons liquid-holding capacity.

Number of Pits

With an increase of septic-tank capacity, codes call for an increase in estimated wastewater volumes. Mr. Richards suggested 16,800 gallons per day (42 apts. x 4 occupants x 100 gal./occupant per day). This estimate could be inserted in formulations and the corresponding number of pits could be estimated.

Spacing of Pits

The Department preferred a spacing of pits of 12-ft. edge to edge.

Expansion Room

It was requested that perhaps 400% room be set aside for expansion of the proposed system. This might easily be accommodated with areas designated in plans to be drawn. After all, the pits require little overhead space and could even be placed in parking strips, planting areas, and the like.

Barrier

A barrier is to be placed over gravel backfill in pits and a shallow soil backfill. It was suggested that a layer of concrete be used to provide the best seal. This could be easily done during construction.

Supervision of Construction

The Department has concern over the construction contemplated. That would not be an unusual concern for an unusual system. It would seem logical to do that work myself, I could do so, and it would be in the best interests of the project if I did.

UNANSWERED QUESTIONS

Apparently, when Mr. Ken Ramsey was discussing the Rio Bravo Tennis Club, community sewering was understood to be an eventual solution to sewage management. A community sewer and a single treatment site is no longer planned. The Department agrees that the current plans for subsurface disposal seem sensible. They need, however, discussions on the following:

1. Provision of a possible backup system, perhaps space for spray irrigation.

2. A discussion of the ultimate disposition of subsurface percolating effluents -- will effluents surface along a road cut, or the like? (This question was prompted by current problems with effluent surfacing from a ditch or the like, from the nearby County golf course.)

3. A discussion on the kind of treatment the soils should offer percolating effluents.

4. A discussion on the use of subsurface systems as a permanent method of management (alternation of fields, soil puddling, etc.).

5. A clearly defined plan for permanent management of the system (I suggest that my office be involved, at least in the immediate future).

6. A discussion of the advisability of several treatment sites rather than gathering effluents into one large problem.

I can answer the above questions and also offer a comparison of subsurface treatment against surface methods of management -- spray irrigation, for example.

The Department had only one log of a soil boring. It did not extend below 40-ft. and they requested a deeper boring. I suggest that your office contact the Department about this matter.

WATER QUALITY CONTROL BOARD, CENTRAL VALLEY REGION (WQCB,CVR)

The WQCB,CVR, must become involved in deliberations at some point in time. Apparently, a Mr. Harlow is the

staff member who might be contacted. It seemed reasonable to wait until the local authorities are solidly behind the proposed methodology and at that time, the WQCB, CVR, be contacted. Most probably, involvement of the WQCB, CVR, will generate phone calls to local authorities. We want no equivocal local positions.

Regards,

John Timothy Winneberger, Ph.D.

IV-D-9

THE KERN RIVER

OLCESE WATER DISTRICT

KERN COUNTY, CALIFORNIA

March 29, 1974

Scott Soule & Associates
Orange, California

General

Location -- The proposed Olcese Water District water treatment and pumping plant is located on the south bank of the Kern River in the south half of Section 3, T29S, R29E, MDB&M, about seven miles east of the City of Bakersfield. The project area for the treatment facility is on a narrow shelf below the steep bluff overlooking the river in this area. The plant will be located at the foot of a wash leading northward and down from the river terrace alluvium to the river and will be slightly less than one-quarter mile upstream from the southern boundary of the Kern River County Golf Course. The intake structure will be located some 750 feet upstream and will utilize part of the diversion intake for the old abandoned canal that ran between the bluff and the river to serve irrigation water to what is now the Hart Park area.

Water from the treatment plant will be pumped to a steel storage tank 50 feet in diameter and 24 feet high located on a hill south of the golf course and west of the treatment plant where gravity service can be provided the proposed Rio Bravo Tennis Ranch to the west and future residential developments to the east.

To produce a good quality of potable water, the treatment planned is to use aluminum sulfate followed by filtration to clarify the water which will then be chlorinated and delivered to the consumer through a closed system. Initial capacity is estimated at about 450 gpm and ultimate capacity is planned at about 1350 gpm.

The flocculated aluminum sulfate residue and other detritus removed from the water will be retained in two wash water ponds which can be cleaned as necessary.

Kern River -- The Kern River watershed drains the southern end of the Sierra Nevada. Elevations range from just over 500 feet at the project to over 14,000 feet at the crest of the highest peaks. At the headwaters seasonal precipitation may range up to 50 inches, most of which occurs as winter snowfall. Approximately 70% of the annual run-off occurs between April 1 and July 31, during which time the flow may average around 1,500 cfs as compared with a flow of around 350 cfs for the period August 1 through March 31.

Isabella Reservoir is a large fluctuating multi-purpose reservoir formed by an earthfill dam about one-half mile below the confluence of the North and South forks. The U.S. Army Corps of Engineers completed construction of Isabella Dam in 1954 and has since operated the reservoir for flood control, irrigation, power and recreation benefits. At gross pool the reservoir stores some 570,000 acre feet of water and has a surface area of 11,200 acres.

For all practical purposes Isabella Reservoir is the only significant storage facility on the river proper. There are some minor domestic and irrigation diversions above the project location but most of the Kern River discharge flows by the project. According to the U.S. Geological Survey records for the 1971 water year the maximum flow of record was 36,000 cfs in 1950 and 9,290 cfs in 1966 or subsequent to the construction of Isabella Reservoir. The minimum flow was 26 cfs which occurred in December 1970, and while not so stated, probably resulted from dewatering the river either to search for a body or for construction purposes.

The following table shows the mean flows by month of year over the period of record and also the maximum and minimum average monthly flows.

Flow of the Kern River at the First Point for the period 1894-1973*
(Mean flows in cfs)

Month	Monthly Means	Maximum Month	Minimum Month
January	571	2,803	186
February	694	3,521	196
March	976	6,149	231
April	1,632	8,096	394
May	2,509	10,050	488
June	2,322	8,349	236
July	1,147	6,503	134
August	476	2,299	96
September	281	973	92
October	268	679	111
November	320	519	138
December	453	5,104	162

*For the period subsequent to 1953 when storage started in Isabella Reservoir, figures reflect the computed natural flow.

Fishery

Productivity -- The Kern River ranks as one of the better streams on the western Sierra Nevada in terms of biological productivity. Limnologists Carlander[1] and Moyle[2] correlate productivity with water chemistry, especially carbonates ($CaCo_3$) and phosphates (PO_4). Moyle classifies as poor fish producers waters containing less than 40 ppm of carbonate and less than 200 ppb of phosphate.

Carbonate and Phosphate Comparison of Selected Streams tributary to the San Joaquin Valley[3]

Water	Station	$CaCO_3$ ppm	PO_4 ppb	pH
Kern River	below Isabella	94	450	7.5
Kern River	near Bakersfield	61	300	7.8
Tule River	near Porterville	135	50	8.2
Kaweah River	below Terminus	45	300	7.8
Kings River	below Pine Flat	17	25	7.0
San Joaquin River	below Millerton	17	125	7.3
Merced River	below Exchequer	43	25	7.6
Tuolumne River	below Don Pedro	110	100	7.9
Stanislaus River	below Tullock	29	50	7.4

1 Carlander, K. D.; 1955, "The Standing Crop of Fish in Lakes," Fish. Res. Bd. Canada Jour. Vol. 12, No. 4, pp. 543-570.

2 Moyle, J. B.; 1956, "Relationships Between the Chemistry of Minnesota Surface Waters and Wildlife Management," Jour. Wildlife Mgmt., Vol. 20, No. 3, pp. 303-320.

3 From a California Department of Fish and Game, Region 4, file memorandum by P. V. Hansen, Asst. Fisheries Biologist, dated January 21, 1972.

Temperatures -- Under conditions of regulated flow water temperatures during mid-summer usually peak at from 74° - 78°F. during August in the stretch of river from the mouth of the canyon to Bakersfield. Water temperatures usually will exceed 72°F. in July and remain in the 70°s well into September.

The high summer temperatures preclude a year-round trout fishery. A "put and take" trout fishery is feasible starting in October or November and continuing until April or May. The Department of Fish and Game is stocking catchable sized trout in Hart Park Lake but not in the river itself at this time.

Fish species -- Any of the fish species found in the upper river or in Isabella Reservoir could be found in the river bordering the project area. Fish known from this stretch of river include:

Largemouth bass	Micropterus salmoides
Smallmouth bass	Micropterus dolomieui
White catfish	Ictalurus catus
Sculpin	Cottus sp.
Sucker	Catostomus sp.
Hardhead	Mylopharodon conocephalus
Sacramento squawfish	Ptychocheilus grandis

All of the above species were present in fair numbers except suckers which were the dominant species by weight in a fish population sample using rotinone and seines. This type of sampling does not give a complete picture because of the difficulty of recovering fish. The river bottom in the sampling area was predominately boulders and large cobble. Water depth ranged from one to three feet and water velocity was rapid, probably between two and three feet per second.

Summary of Results of Fish Sampling
in the Kern River approx. one mile
above Rancheria Road Bridge
November 27, 1971 1/

Species	Pounds per Mile	% Composition by Number	% Composition by Weight
Smallmouth Bass	137.3	49.61	15.62
White Catfish	27.5	5.51	3.12
Sculpin	13.7	1.57	1.56
Squawfish and Hardhead	91.5	12.60	10.42
Sucker	608.58	30.71	69.27
TOTALS	878.58	100.00	99.99

1 Preliminary data taken as part of the Department of Fish and Game studies related to the relicensing by the Federal Power Commission of hydroelectric power projects on the Kern River, Region 4 file memorandum dated January 6, 1972, by Jack Callison, Seasonal Aid.

In 1972 the river below Isabella Reservoir was chemically treated by the Department of Fish and Game to remove all fish life preparatory to instituting a new fisheries management plan. Game fish species, smallmouth bass and channel catfish, were restocked. One interesting result of the treatment is the "bloom" of crayfish. This in turn has resulted in excellent growth of the smallmouth bass, which had been removed from the river prior to treatment and restocked, and of the channel catfish.

It is not expected that all rough fish will have been eliminated and within a few years the rough fish population may build up again. This is due in part to selective harvesting by man. The larger and more desirable game fish are harvested continuously, hence their numbers are depressed whereas the rough fish experience little or no fishing pressure and they expand to take over areas vacated by the game fish that are caught.

Angling -- With the exception of the area from Hart Park to the Kern River Golf Course, most of the river to the mouth of the canyon runs through private property, much of which is posted against trespass. This reach of river is, however, one of the better smallmouth streams in the state.

Impact

Operation of the treatment plant as proposed should not adversely impact the biota of the river.

McKee and Wolf[1] give a 96-hour Median Tolerance Limit (TLM) for aluminum sulfate at a concentration of 235 milligrams per litre using *Gambusia* sp. (mosquitofish) as the test animal in water at a temperature of 19 - 22°C.

The usual water treatment range is from 5-70 mg/l with most plants operating at the lower end of the scale.

The intake structure will be located in a subchannel on the south bank of the river. A four by four foot concrete intake box will be screened with a fabricated grating of ½ inch bars on 3/4 inch centers.

This will screen out all adult and most fingerling fish. The location and position of the screen will tend to influence small fish to seek protection along the bottom of the stream channel rather than braving the open water and current which would lead them into the screen.

The diversion of from one to a maximum of three cfs from the river will have so little impact on the biota of the river that it is doubtful if it could be measured.

Care should be exercised during construction to avoid unnecessary disturbance of the river channel or banks, and to prevent spoils or other materials from entering the river.

1 J. E. McKee and Wolf; 1963, "Water Quality Criteria, 2nd ed.," State Water Resources Control Bd., Pub. 3A, 548 pp.

Enhancement

Possibilities for enhancement include the following:

1. A special-purpose fishing stream could be created by renovating the old canal. This would entail redesigning the intake structure and providing a return to the river at the golf course boundary. Both intake and outlet would have to be screened.

The small stream could be used for children's fishing, for an educational aquatic laboratory, for an experimental test stream, or, stocked with large catchable trout from a commercial hatchery, as a barbless hook catch and release stream on a reservation basis only.

If a similar, compatible program could be arranged with the County of Kern, the new stream could continue around the bend of the river to Ming Lake. The stream could be used by the County for any one of several beneficial purposes.

A water-driven rotary fish screen could be used to divide the stream sections at the golf course and to provide the necessary screening at the outlet to the river.

2. An educational aquarium featuring fish from the Kern River could be constructed at the treatment plant to use filtered water before chlorination. This could be designed with automated colored slides or movies and a sound track explaining both the aquarium exhibit and the operation of the treatment plant. The facilities would be made available on a reservation basis to classes from elementary schools and would provide instruction on the use of water for domestic purposes and water as an aquatic habitat.

IV-D-4

THE BIOTIC ENVIRONMENT

OF THE RIO BRAVO SITE

Report by George E. Lawrence PhD.
January 8, 1974

Additions to Plant List
9 Jan 1974



A view of Lake Ming from the eastern knolls of the proposed Rio Bravo Project site. Alfred Harrell highway is visible at center level.



The eastern area of the Rio Bravo Project Site is shown with the Kern River channel visible at the far left in this view.

GENERAL FEATURES OF THE BIOTIC ENVIRONMENT

The Rio Bravo site is located within the elevational range of 530 feet to 610 feet and lies on a stream terrace on the western bank of the Kern River, some eight miles east of Bakersfield, California. The habitat type is essentially valley grassland and consists of both native Californian species of plants and animals as well as those non-native forms that have been introduced into this part of the state in connection with the livestock industry. Surprisingly, some of the non-native plants are now among the most valuable available in cattle production in this part of the state. Such grasses as red brome grass, Bromus rubens, and wild oat, Avena fatua, as well the early growing forb red-stem filaree, Erodium cicutarium, have been introduced from the Mediterranean region of southern Europe, and have become very important species in the grazing regions of California.

In order to obtain some degree of objective method of evaluating the vegetative cover within the limits of the project area, a standard series of vegetational transects were completed. Simply stated, the process consists of sampling the dominant vegetative cover type along a one meter wide strip for several hundred meters. Two such transects were made during the data collecting period, each of 500 meters length, giving a total of 1000 linear meters of transect for analysis. Herbarium specimens were taken along the course of the transect studies in order to provide some basis for accurate determination of the classification of the plants counted within the transects (see Table I).

Table I

SUMMARY OF VEGETATION ON RIO BRAVO SITE

Reported in square meters per transect (500 meters)

		TRANSECT I	TRANSECT II
TREES AND SHRUBS	Populus fremontii Fremont Cottonwood (n) Atriplex polycarpa Saltbush (n) Hymenoclea Salsola Cheezebush (n) Isomeris arborea Burrofat bush (n)	$14/m^2$	$10/m^2$
GRASSES	Avena fatua Wild Oat (e) Bromus rubens Red Brome Grass (e) Bromus rigidus Ripgut brome grass (e) Capriola dactylon Bermuda Grass (a) Hordeum murinum Foxtail Barley (e) Oryzopsis hymenoides Indian Rice Grass (n)	$247/m^2$	$215/m^2$
FORBS	Astragalus lentiginosus Black loco weed (n) Amsinckia douglasiana Orange fiddleneck (n) Brodiaea capitata Blue Brodiaea (n) Lupinus nanus Meadow Lupine (n) Oenothera dentata Sun Cup (n) Orthocarpus purpurascens Owls Clover (n) Eriogonum angulosum Pink Buckwheat (n) Eriogonum pusillum Dainty Buckwheat (n) Delphinium gypsophilum Gypsum larkspur (n) Verbascum virgatum Turkey Mullein (e) Sisymbrium officiale Hedge Mustard (e) Erodium cicutarium Red-stem Filaree (e) Cucurbita foetidissima Wild Gourd (n) Hemizonia virgata Tarweed (n) Salsola Kali Tumbleweed (a) Gilia tricolor Birds Eye Gilia (n) Navarretia leucophylla White Navarretia (n) Corethrogyne filaginifolias Telegraph Wd (n) Chrysopsis villosa Yellow Chrysopsis (n) Centromadia pungens Spiny madia (n) Solidago californica Goldenrod (n) Salvia carduacea Thistle Sage (n)	$206/m^2$	$229/m^2$
ROCKY DENUDED SOIL	Areas of bare soil denuded both by rodent activity and access roads	$33/m^2$	$46/m^2$

Legend of the sources of plants on the Rio Bravo site includes many native plants and a number of non-native plants from Asia and Europe.

Native Plant= n
European = e
Asiatic = a

Added 9|Jan/74 Lepidospartum squamatum Scaly Composite

It must be pointed out that this transect analysis does not intend to provide a taxonomic coverage of all isolated plants within any given area, but it serves to record those plants that form a conspicuous part of the plant cover within the several elevational zones of the site. An additional limitation in the analysis was imposed by the winter period of plant growth, in view of the fact that most grassland plant species are in the best growth form during the late spring period of March through June.

The State of California has provided some important resource publications to focus attention on the most unique features to be considered in an Environmental Impact Report. The booklet named AT THE CROSSROADS, is a report on the endangered and rare forms of California Wildlife species, published in 1972. A second publication has been published through the University of California at Davis and reports the names of each of the rare and endangered native plants within each county of the state. As I am at the present time working on the California Natural Areas Coordinating Council which is a state wide study for the California Office of Planning and Research, these two publication provide an important and pivotal resource in the analysis of the degree of biotic impact within any given habitat type.

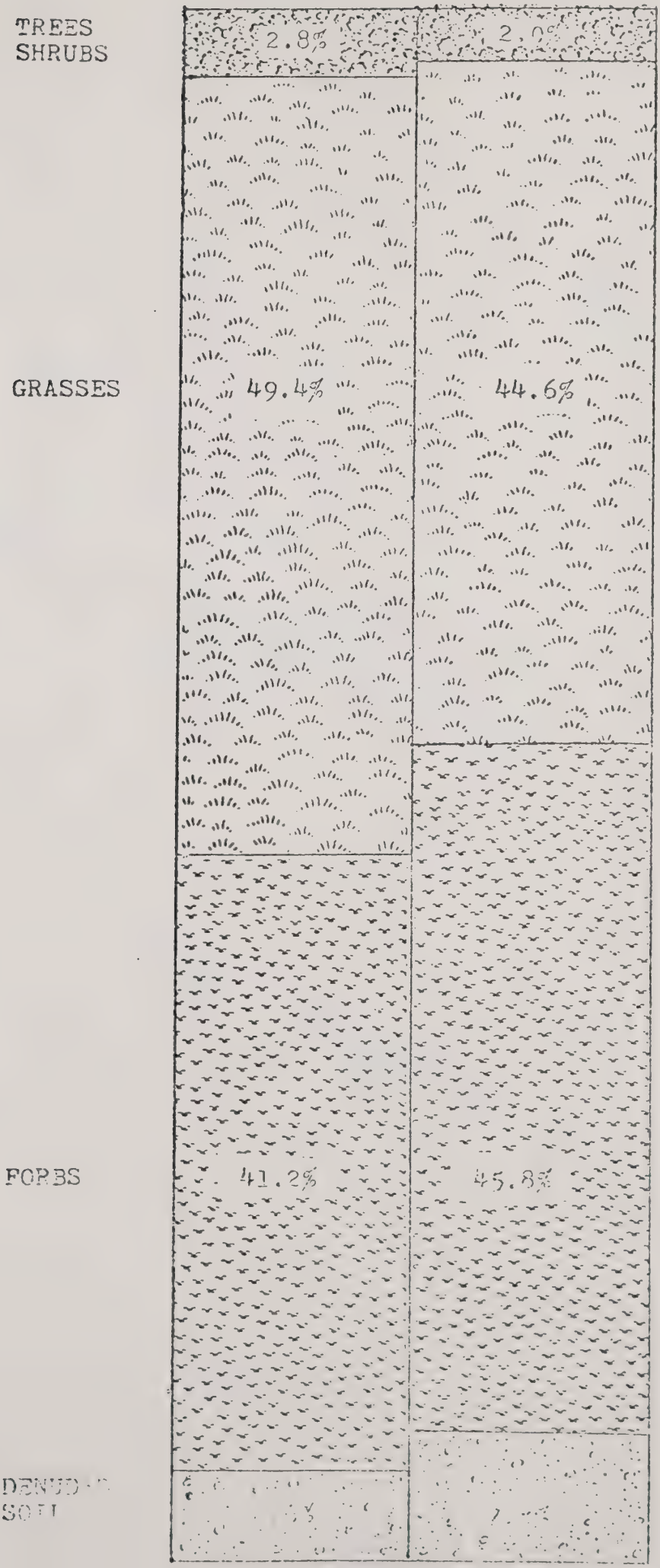
Each of the collected plants and reported animal types will be examined in relation to these state-wide publications, in order to accurately assess the extent of impact that may be imposed by the projected Rio Bravo Site Development.

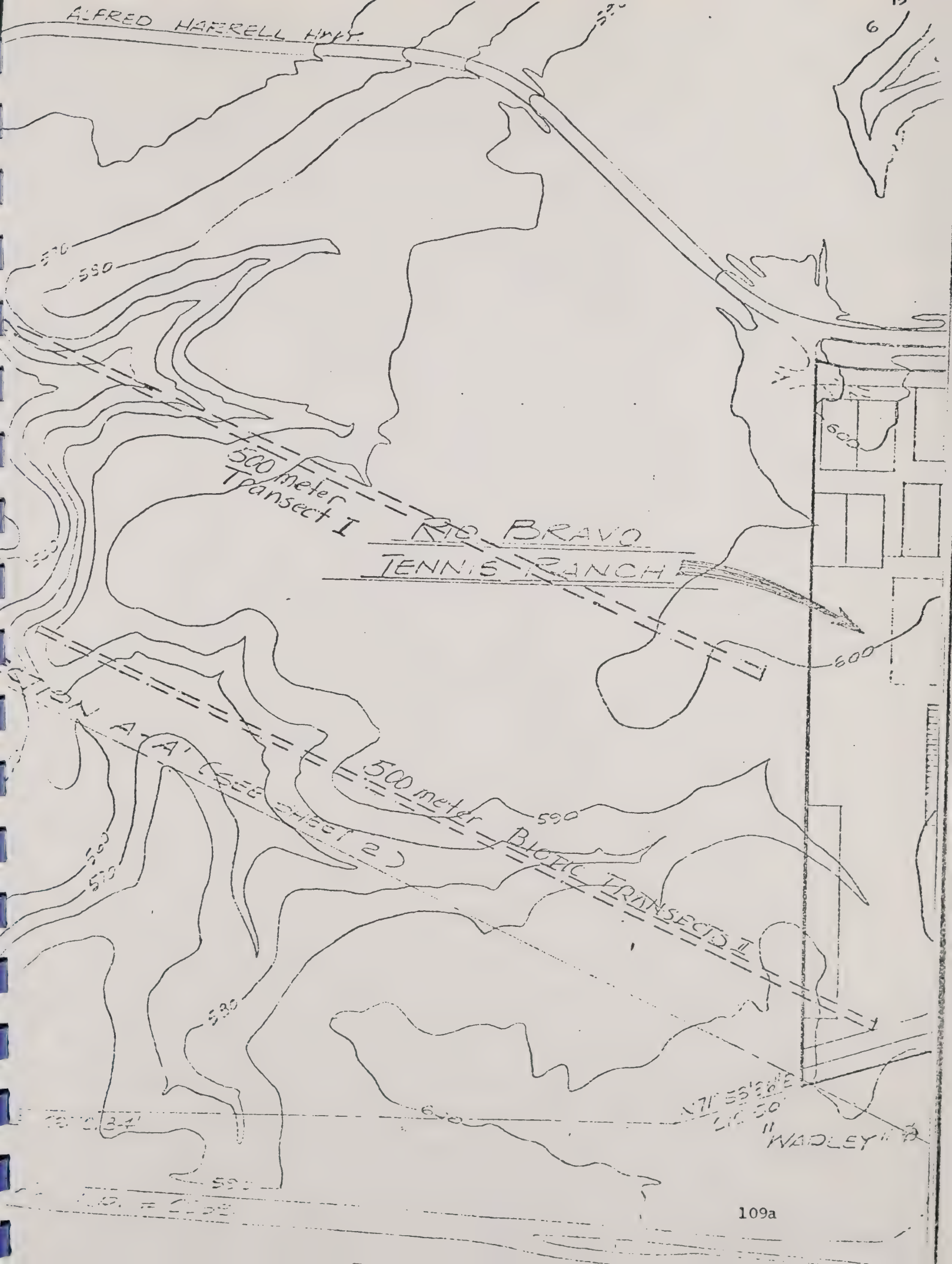
The results of the transect data shown in table I give some opportunity to compare the amount of grassland to the amount of area covered by forbs or herbaceous vegetation. In addition to these more dominant types of areas,the square meters of bare soil are also reported which gives some measure of the impact of mans access roads through the area as well as the denuded soil caused by rodent burrows and erosional channels alcng the westerly parts of the site.

In order to quickly compare these vegetative types within the site, Table II was prepared to indicate the percentage cover of each of the vegetation and exposed soil types along the 1000 meters of total transect. Only a very minor part of the area included trees and shrubs , and these were present on the banks of the most westerly drainage channels where the direct exposure of the suns rays are reduced by the slopes and where the runoff water is more concentrated. These same slopes are the areas where the most purely native vegetation and California wild flower species are to be found, consequently such slopes may deserve some special planning consideration in the overall development plans, if such natural scenic features are to be included in the attractive attributes of the Rio Bravo Site.

Conversley, the most level ground which has been available for grazing of livestock and for vehicular access, is the type of area with the higher percentage of non-native grasses and forbs. The amount of disturbance that the topsoil has sustained over past years has been a key factor in allowing the success of the exotic or non-native vegetation to gain a foothold. A map showing the elevational contour lines and the transect routes is shown as Table IV.

Table II


TRANSECT I
TRANSECT II
TREES
SHRUBS
2.8%
2.0%
GRASSES
49.4%
44.6%
FORBS
41.2%
45.8%
DENUDED
SOIL


ALFRED HAERELL HWY.
570
590
530
6
600
500 meter
Transect I
RIO BRAVO
JENNIS RANCH
600
A1A
(SEE SHEET 2)
500 meter BIOTIC TRANSECTS II
590
570
530
610
WADLEY

ASSESSMENT OF WILDLIFE RESOURCES

During the past hundred years within this part of California the primary designation of land use in the lower foothills has been in livestock production. As our population increases and as people become more mobile, such land management practices as rural recreation and outdoor sporting activities gain in land planning usage.

Clearly an important aspect of rural recreation planning is the consideration of the very attractive wildlife and vegetational features of a site, that cause it to be sought by the consumers to be served by the plan. If it were possible to provide all the desired architecturally needed facilities and at the same time to maintain all the scenic biotic features in site planning, we would have acheived the utopian advantages of both worlds. As a matter of fact the practical needs of the construction process may so overshadow the natural features of the site that the desirable natural features of the area become almost entirely lost, and at some later date an artificial landscaping effort is initiated to regain some semblance of the natural state of the site.

Those species of vertebrate wildlife which are native to the Rio Bravo Site that have been observed directly as well as noted indirectly, are included in the citations in Table III. One of the limitations in this effort is to point out that the resident populations of animals should be sampled during most of a year rather than during a brief period of December and January. Of course in addition to the resident species are those which are

non-resident or migratory. These gypsy forms of wildlife may be more numerous both in actual numbers and in species, than those animals or birds which are resident in an area. The marsh hawk, Circus cyaneus, and the other predatory hawks and owls surely do not depend on so small an area as this project site for their actual total feeding area. This rule would also apply to the predatory badger that may spend some time in a given area but moves to adjacent sites as the rodent food supply determines.

The important consideration in an assessment of wildlife changes in any one area is the determination to protect much of habitat which provides food, cover, and nesting areas for the local species of vertebrates under consideration. When the habitat is lost -- the animal life is lost.

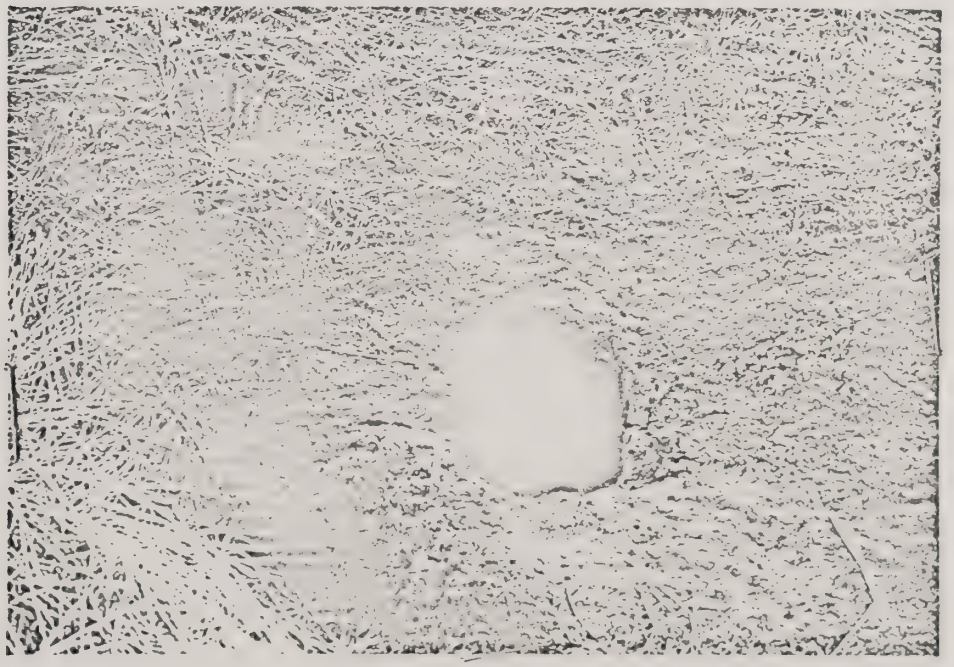
MAMMALS are limited to those few species of rodents well adapted to grassland habitat. Cottontails, jackrabbits, ground squirrels, and some kangaroo rats are natural forms within the area. Those rarer forms of predators that may move through the area such as an occasional coyote, or kit fox, or badger may in fact not depend on an area of this size except for a very small part of its feeding activity pattern. (See illustration Page 10)

BIRDS are abundant both on the level grassy regions of the site and on the denser slopes of the gulley area to the west. Horned larks, Eremophila alpestris, meadowlarks, Sturnella neglecta and house finches Carpodacus mexicanus, are the most prominant numerically and these typically are flocking forms so that they may appear to be very abundant at any one time. In view of their feeding behavior which includes both weed seeds and insects, these are surely among the beneficial wildlife species in the area.

Those species of birds such as the White crowned sparrow, Zonotrichia leucophrys, Western Bluebird, Siala mexicanus, Pipit, Anthus spragueii, and the Western Robin , Turdus migratorius, are clearly not dependant on this site as resident species but are normally migratory into such mild lower elevation grassy areas as this Kern River grassland. The man-made recreational facilities of the adjacent Ming Lake represents a beneficial habitat development for wildlife habitat. The narrow deeper course of the original Kern River in this part of the state would not accomodate the existing waterfowl populations that are present during much of the winter migratory period of the year. Many hundreds of Ruddy Ducks, Pintail Ducks, Blue Winged Teal, Pied-billed Grebes, and some Mallards can be seen on the quieter regions of Ming Lake. The ever abundant American Coot or Mudhen is by far the most tolerant of mans water recreation activities and at the same time is the most abundant species on the lake. REPTILES AND AMPHIBIANS are quite limited on the project site with the tan colored Side blotched Lizard Uta stansburiana, present on the more sandy parts of the area. The beneficial gopher snake Pituophis catenifer, is an important predator on the pocket gopher population. This natural form of gopher control by biological control of harmful organisms by existing predators, should be recognized as land use activities are subject to change. The only amphibian species directly observed during this wildlife inventory was the tiny Treefrog which was present in the deepest gulley area on the site.



Extensive gulley region in the western part of the Rio Bravo Tennis Project site. The newly developed Kern County Camping Park is shown in the upper part of this picture.



Rodent burrow system of the Beechey Ground Squirrel has been enlarged in this picture by the working of a predatory badger Taxidea taxus . Dec. 28, 1973.

Table III

SUMMARY OF THE ANIMAL LIFE ON THE RIO BRAVO SITE

(The following organisms were observed directly or were developed from evidence of animal signs and burrow systems, during the brief period of Dec.26, 1973 through January 8, 1974)

MAMMALS

Audubon Cottontail Sylvalagus auduboni (Ob)
California Jackrabbit Lepus californicus (Ob)
Kangaroo Rat Dipodomys heermani (sn)
Badger Taxidea taxus (Sn)
Ferile Cat Felis domesticus (Ob)
Beechey Ground Squirrel Citellus beecheyi (Ob)
Pocket Gopher Thomomys bottae (Sn)

BIRDS

Marsh Hawk Circus cyaneus (Ob)
Kestrel Hawk Falco sparverius (ob)
Burrowing Owl Speotyto cunicularia (Rp)
Red-shouldered Hawk Buteo lineatus (Rp)
Mourning Dove Zenaidura macroura (ob)
Meadowlark Sturnella neglecta (Ob)
Horned Lark Eremophila alpestris (Ob)
Western Robin Turdus migratorius (Ob)
Western Bluebird Sialia mexicanus (ob)
Pipit Anthus spragueii (Rp)
American Goldfinch Spinus tristis (Ob)
House Finch Carpodacus mexicanus (Ob)
White-crowned Sparrow Zonotrichia leucophrys (Ob)

REPTILES

Side-blotched Lizard Uta stanburiana (Rp)
Gopher Snake Pituophis catenifer (Rp)

AMPHIBIA

Pacific Treefrog Hyla regilla (Ob)
Western Toad Bufo boreas (Rp)

Sources of the Vertebrate Animal List:
Observed directly= Ob
Animal Signs seem= Sn
Reported by others= Rp

ASSESSMENT AND MANAGEMENT OF THE PROPOSED

RIO BRAVO BIOTIC ENVIRONMENT

Natural aesthetic values of this project site are of prime concern because they represent the very aspects most sought by both the potential new ownership and the management of the proposed Rio Bravo Tennis Ranch. Management of the site during the construction of the facilities and during the landscaping of the site should seek to restrict disturbance of the topsoil and particularly the native plant life. Such an effort to minimize disturbance to the native vegetation will yield both scenic benefits and will reduce erosional losses as well. While the presence of the proposed tennis ranch will have an effect on the visually consistent natural environment, this negative impact can be minimized by the exercise of high quality architectural concepts that seek to design with nature. such design concepts make use of the most appropriate natural building materials, and follow up by the use of native landscaping plant materials.

Such undesirable plants as the tumbleweed or Russian Thistle Salsola kali, will tend to move into denuded building sites and road cuts and it will prevent regeneration of native plant species in these areas. Appropriate landscaping plantings are needed very shortly after the major grading work is completed in order to acheive optimal control of surface erosion as well as to provide a sodded surface which will help to exclude such prickly invader species as tumbleweed and the common mull-

Some of the more attractive plants which are native to the region and are appropriate as natural landscaping plant choices include the Western Sycamore Platanus racemosa, and Buttonwillow Cephalanthus occidentalis as forms of deciduous shade trees. Among the useful shrub species that will enhance the site are the colorful flannel bush or Fremontia, Fremontodendron californicum and Western Redbud Cercis occidentalis, which have been established in the metropolitan Bakersfield area as shrubs typical of this part of California. An evergreen shrub which provides both red berries and glossy green foliage is the Toyon or California Christmas berry Photinia arbutifolia; this shrub serves also as a source of food for native birds during the winter months.

Wildflowers which are currently present on the site include the orchid colored Thistle Sage Salvia carduacea, (see Page14) and the darker blue Chia Salvia columbariae. Several species of the lacy buckwheat plants are present in the genus Erodium with the pink species angulosum the more abundant than the smaller white pusillum type.

No species of either plant life published by the California Native Plant Society, - or animal life cited by the California Department of Fish and Game have been located within the site of the Rio Bravo Tennis Ranch, which are listed as a rare or endangered species. In addition much of the existing vegetation is non-native and represents introduced plant forms.

The biotic environment will therefor receive a minimal impact by the proposed project, and this impact can be balanced by a [illegible] long range site management program giving maximum consideration to the valuable but fragile biological components.



Thistle Sage Salvia carduacea stalks visible against the skyline, represent one of the native wildflower species of broadleaf forbs.



Red Brome Grass, Bromus rubens, shown in the foreground is one of the common European imported forms of grass on the Rio Bravo site.

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Resume of George Edwin Lawrence

CONSULTING EXPERIENCE:

California Natural Areas Coordinating Council (State OPR 1973 work)
Environmental Impact Report, Biotic section, Stallion Springs Nov. 1972
Kern County Planning Commission, Open Space Plan, Biotic element, 1972
Kern County Supt. of Schools, Red Rock Canyon Ecological Analysis, '72
Forestry Dept, Univ. of Calif., Whitakers Forest Wildlife analysis 1968
National Science Foundation, Univ. Calif. Ecological Field work '66 '67
California Div. Beaches Parks, Park Naturalist Supervisor, 1954_'57

ACADEMIC EXPERIENCE

Bakersfield College, Biologist, vertebrate Ecologist, 1947 to current.
Fresno State College, summer Natural History courses, 1959_1964
University of Calif. summers, research vertebrate ecologist, 1965_68.

EDUCATION

Richmond Union High School, Richmond California. grad. Feb. 1938.
Univ. of Calif. Berkeley, California. A.B. 1946
Univ. of Calif. Berkeley, California. M.A. 1948
Univ. of Calif. Berkeley, California. PhD. 1960

Married: January 17, 1943. Four children.

Age: 53. Born March 25, 1920

RECENT PUBLICATIONS

The California Wildlife Region, College Text, Naturegraph Press '65
Ecology of Vertebrate Animals in relation to chaparral fire in the Southern Sierra Nevada Foothills. Ecology. vol. 47 Spring 1966
Effect of Forest Manipulation on Deer Habitat in Giant Sequoia. Jour. Wildlife Management. vol. 36. pp 595-605. April 1972.

ADDRESS AND PHONE

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Bakersfield College 871-7120. ext 241.

IV-D-4 (SUPPLEMEN

Rickett, Ward Delmarter
File: Sp. Plan, Rio Bravo Ranch
Response to questions on the draft EIR
Date: January 24, 1975
From: George Lawrence PhD. Biotic Analysis. G. Lawrence

Section III. A. Environmental Impact

Comment 15. The question as to the ability of the adjoining lands to be able to support displaced wildlife is a valid consideration.

answer __ This issue is treated in the Biotic analysis part of the draft EIR, on pages 12 and 13. On site field studies have determined that many of the existing wildlife species are non-native and the previous grazing impact has allowed the introduction of many asiatic or european species of plants. The absence of any of the native plants or animals on California's rare and endangered list of wildlife species, tends to support the conclusion that the biological impact will be minimal. Adjoining lands to the site have been developed in such a way to enhance the wildlife habitat for both migratory and native wildlife species. Both the Lake Ming site and the Kern County park sites are examples of developments that have increased habitat diversity and therefore have made available improved habitat conditions for wildlife in the area.

Section III. B. -- Any Adverse Environmental Effects....

Comment 2. " Wildlife will not be relocated to surrounding areas. They will likely be eliminated".

answer--It is the judgement of the local biotic analyst that those species of wildlife shown on Table III of the Biotic part of the draft EIR, are species that are eurytopic forms and are sufficiently adaptable to the proposed type of Rio Bravo Tennis Ranch landscaping plans to be able to continue to be resident in the area in essentially the same density.

IV-C-6

Archaeological Impact Report

on the

Rio Bravo Tennis Ranch

Prepared for:

Rickett, Ward and Delmarter
2901 H Street
Bakersfield, California

by:

Robert A, Schiffman
Archaeologist
248 Jefferson Street
Bakersfield, California

February, 10, 1975

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Dept. of Anthropology
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Mr. Charles Karoly
Rickett, Ward and Delmarter
2901 H Street
Bakersfield, California

February 10, 1975

Dear Mr. Karoly;

Enclosed please find the report on the archaeological impact statement prepared on the Rio Bravo Tennis Ranch development. A billing statement is also inlcuded.

If you have any questions regarding this report please do not hesitate to contact me.

Sincerely,

Robert A. Schiffman

Robert A. Schiffman
Archaeological Consultant

248 Jefferson Street
Bakersfield, California
93305

ph. 324-5198

Archaeological Impact Report

Location:

The location of the project area is defined as the North ½, of the South ½ of Section 4, Township T29S, Range R29E on the Rio Bravo Ranch Quandrangle Map, 1954 Edition.

The following report is an archaeological evaluation of these lands.

Field Reconnaissance and Presence of Archaeological Resources:

The format for the archaeological survey of the Rio Bravo Tennis Ranch impact area consisted of an Intensive Field Reconnaissnace: "a comprehensive examination of an area to gain detailed information on all classes of archaeological and related phenomena occurring there" (King, 1973). The survey sub-type was a Complete Reconnaissance: "an investigation of every visible portion of the impact area" (King, 1973).

The survey was conducted on foot by the author of this report and one assistant. All sectors of the impact area were thoroughly investigated in order to locate and assess any archaeological materials that might be present there.

After a complete investigation of the property, no archaeological sites were found. Several unassociated flakes of chalcedony and one unassociated hand tool were found, but it it is not believed that these finds were part of a larger assemblage. For an interpretation of these findings, see below.

The only factor that could have affected the findings of the current survey was the grass covering over most of the project area. It is possible that the grass could have obscured additional flakes and any soil coloration changes. Judging from the terrain, its location and the lack of any larger tools, the probability of uncovering additional materials is low.

Interpretation of Findings:

The Yokut Indians lived throughout the general along the Kern River. It is to be expected to find an occaisional tool, flake or projectile point almost anywhere in the area. Such remnants have been found on or near the project property. In addition, there are several large Indian village sites within a mile of the immediate area. Therefore, it is suggested that although no evidence of occupation has been found in the

immediate area, individuals passed through the area frequently on route elsewhere. Local populations may have hunted and gathered in this area as well.

Direct Impact to Archaeological Resources:

Since no archaeological sites were located on the property, it is believed that an adverse direct impact on such materials does not exist.

Indirect Impact to Archaeological Resources:

Owing to the previous development of adjacent lands into a State Park, with a camp ground, picnic areas and a Marina, plus a county golf course and a passing highway, it is believed that an indirect impact on archaeological resource materials does not exist.

Mitigating Measures:

The fact that archaeological finds are not present on the surface does not eliminate the possibility of uncovering such materials during development. If any archaeological materials are located through ground disturbing activities, work crews should temporarily halt work until an archaeologist has an opportunity to assess the findings. Work crews should be informed of this.

Conclusions:

Based on an in-depth survey of the property, it is concluded that:

1. Due to the absence of archaeological resource materials, a direct impact on such materials does not exist.

2. Due to the disturbed condition and intense development of lands adjacent to the impact area, an indirect impact to archaeological materials does not exist.

Ethnographic Statement:

Aboriginally, the territory along the Kern River, including the impact area was occupied by the Yowlumne, a sub-division of the Penutian speaking Yokuts. The Yowlumne extended from Bakersfield eastward along the Kern River, with settlements along both the North and South banks.

These Yokuts subsisted on hunting and gathering, with acorns as their basic staple. Large and small mammals were hunted and fish were taken from the Kern River. As for natural resources, most needed materials were available within their own territorial limits. What was not available could be obtained by trade with other Yokut groups and from neighnoring non-Yokuts populatins. (For additional information, see Latt, 1949).

Robert A. Schiffman
Archaeologist

February 10, 1975

Bibliography

King, Thomas; Moratto and Leonard, Archaeological Impact Evaluation. University of California, Los Angeles, 1973.

Kroeber, Alfred; Handbook of the Indians of California, California Book Company, Berkeley, 1925.

Latta, F.F.; Handbook of the Yokuts Indinas, Bear State Books, Oildale, 1949.

TELEPHONE
(805) 327-1486

2901 H STREET
BAKERSFIELD, CALIFORNIA 93301

CIVIL ENGINEERS
RICKETT, WARD & DELMARTER
2901 H STREET BAKERSFIELD, CALIFORNIA 327-1486
SURVEYORS

File #9933

IV-A-10

January 27, 1975

Bakersfield City School District
Education Center
1300 Baker Street
Bakersfield, Ca. 93305

Attention: Mr. George Palmer,
Associate Superintendent

Gentlemen:

We are preparing an Environmental Impact Report for a proposed development near Lake Ming at the site of the Rio Bravo Tennis Ranch now under construction. A preliminary map of the development is enclosed.

The ultimate maximum permanent population is estimated as follows:

200 condominium units @ 3 persons per unit	600
100 single-family residential lots @ 4 persons per lot	400
Ultimate permanent population	1000

Of the above, the ultimate maximum school age population is estimated to be 400. A possible breakdown is:

Elementary	100
Jr. High	100
High School	100
College	100

We expect that a development of this type would attract people in the older age brackets whose children have either left home or those children living at home would mainly be of high school or college age. If this were the case, the foregoing projection of 400 children, we believe, would be much lower. However, trends do change and the foregoing projection would be based on more or less average population cross section.

In addition, this population will build up over a period of years and, therefore, the impact on the schools will be gradual.

Based on these projections for the elementary and jr. high schools, we need to know:

The schools these children would attend - the average daily attendance of those schools and their capacity - the bus service available - the bus stop location, etc. Also your opinion as to the degree of impact of this development on the existing schools. You should specifically comment on the effect on bus service and future school construction. Also please mention any mitigation measures the developer might take to minimize the impact.

Your answers will not be construed as School District policy, but rather as your informed opinion, based on the facts presently at hand, in order to measure the impacts of this development on the schools in the area.

In the EIR process, you will receive a copy of the Draft Environmental Impact Report from the County and would have an opportunity to officially comment at that time; the information requested at this time is to enable us to get the facts in order to properly prepare the Draft EIR.

We thank you for this information and will appreciate an early reply.

Very truly yours,

RICKETT, WARD & DELMARTER

Charles Karoly

ck:lmn
enc.

TELEPHONE
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BAKERSFIELD, CALIFORNIA 93301

CIVIL ENGINEERS
RICKETT, WARD & DELMARTER
2901 H STREET BAKERSFIELD, CALIFORNIA 327-1486
SURVEYORS

File #9933

IV-A-9

January 27, 1975

Kern High School District
2000 - 24th Street
Bakersfield, Ca. 93301

Attention: Mr. Harry Ward, Assistant Superintendent

Gentlemen:

We are preparing an Environmental Impact Report for a proposed development near Lake Ming at the site of the Rio Bravo Tennis Ranch now under construction. A preliminary map of the development is enclosed.

The ultimate maximum permanent population is estimated as follows:

200 condominium units @ 3 persons per unit	600
100 single-family residential lots @ 4 persons per lot	400
Ultimate permanent population	1000

Of the above, the ultimate maximum school age is estimated to be 400. A possible breakdown is:

Elementary	100
Jr. High	100
High School	100
College	100

We expect that a development of this type would attract people in the older age brackets whose children have either left home or those children living at home would mainly be of high school or college age. If this were the case, the foregoing projection of 400 children, we believe, would be much lower. However, trends do change and the foregoing projection would be based on a more or less average population cross section.

In addition, this population will build up over a period of years and, therefore, the impact on the schools will be gradual.

Based on these projections, for the high school serving this area, we need to know:

The high school these children would attend - the average daily attendance of this school and its capacity - the bus service available - the bus stop location, etc. Also your opinion as to the degree of impact of this development on the existing schools. You should specifically comment on the effect on bus service and future school construction. Also please mention any mitigation measures the developer might take to minimize the impact.

Your answers will not be construed as School District policy, but rather as your informed opinion, based on the facts presently at hand, in order to measure the impacts of this development on the schools in the area.

In the EIR process, you will receive a copy of the Draft Environmental Impact Report from the County and would have an opportunity to officially comment at that time; the information requested at this time is to enable us to get the facts in order to properly prepare the Draft EIR.

We thank you for this information and will appreciate an early reply.

Very truly yours,

RICKETT, WARD & DELMARTER

Charles Karoly

ck:lmn
enc.

BAKERSFIELD CITY SCHOOL DISTRICT

WALTER F. HAUSS, Ed.D., Superintendent
EDUCATION CENTER, 1300 BAKER STREET
BAKERSFIELD, CALIFORNIA 93305

GEORGE C. PALMER
ASSOCIATE SUPERINTENDENT

January 31, 1975

IV-A-10

Rickett, Ward & Delmarter
Civil Engineers
2901 H Street
Bakersfield, California 93301

Attention: Mr. Charles Karoly

Re: Rio Bravo Tennis Ranch Environmental Impact Report

Dear Mr. Karoly:

The Rio Bravo Tennis Ranch is located in the existing attendance area for Eissler Elementary School, grades kindergarten through 6, and the Chipman Junior High School, grades 7 and 8. The district could give consideration to placing that development in the Hort Elementary School, grades kindergarten through 6, and the Compton Junior High School, grades 7 and 8, based upon existing information and growth patterns; however, the current inclination would be to maintain the existing schools for attendance.

The following statistics and opinions are relevant to the impact upon the school district.

	Eissler	Chipman	Hort	Compton
January Enrollment	412	714	418	656
School Capacity (Perm.)	420	795	420*	700

*includes relocatable classrooms on Hort School Site

Additional Classrooms

It would require 4 additional classrooms at the elementary school and 4 at the junior high school sites to accommodate 200 additional children.

Both elementary schools would need at least 4 additional relocatable classrooms. With Chipman's current enrollment, it would be necessary to provide 2 additional relocatable classrooms.

Transportation

24 students are currently being transported to Eissler, Chipman and Highland High Schools in a 42-passenger bus. Additional and larger buses would be needed in the future depending upon the growth of the area.

A bus stop could be located in the immediate vicinity, probably along the

main roadway.

It would be much more efficient to provide transportation to Eissler and Chipman since schools are located in such close proximity, along with Highland High School.

Note: 30 students per elementary classroom and 35 per junior high were used to figure the school capacity.

If the enrollment trends continue in the pattern currently established, there should be no problem in providing adequate housing for the students in these schools. Both sites are of adequate size to allow for additional classrooms. A major consideration is, however, that under present economic conditions, a minimum of $1500 must be budgeted in order to relocate one classroom from one school site to another. I am sure there will be a substantial increase in the assessed valuation of the property as this proposed development progresses, which will, in all likelihood, offset necessary expenses in providing space for the anticipated student population. Should the growth in this area exceed that which you have anticipated in your letter, it will be necessary for the district to give consideration for utilizing all four school sites to accommodate students from the Rio Bravo Tennis Ranch area.

I hope that this information will be of benefit to you in completing your project. Should further information be needed, please contact me.

Sincerely,

George C. Palmer
Associate Superintendent

bw

KERN HIGH SCHOOL DISTRICT

JOHN W. ECKHARDT, DISTRICT SUPERINTENDENT

ARVIN HIGH SCHOOL
BAKERSFIELD HIGH SCHOOL
BAKERSFIELD ADULT SCHOOL
BURROUGHS HIGH SCHOOL
EAST BAKERSFIELD HIGH SCHOOL
FOOTHILL HIGH SCHOOL
HIGHLAND HIGH SCHOOL
KERN VALLEY HIGH SCHOOL
MCFARLAND HIGH SCHOOL
NORTH HIGH SCHOOL
SHAFTER HIGH SCHOOL
SOUTH HIGH SCHOOL
VISTA HIGH SCHOOL
WEST HIGH SCHOOL

GRANT W. JENSEN
ASS'T SUPERINTENDENT, INSTRUCTION
2000 TWENTY-FOURTH STREET
BAKERSFIELD, CALIFORNIA
93301

February 3, 1975

IV-A-9

Mr. Charles Karoly
Rickett, Ward & Delmarter
2901 - H Street
Bakersfield, California 93301

Re: File #9933

Dear Mr. Karoly:

This letter is pursuant to information requested in your letter of January 27, 1975, regarding the high school serving the proposed development near Lake Ming at the site of the Rio Bravo Tennis Ranch.

This development is approximately eight miles from the nearest school in our district which is located at 501 Park Drive, Bakersfield, California. The average daily attendance for this school for the 1973-74 school year was 1,816. It must be understood that because the schools serving this area are at near-capacity enrollments, the school location mentioned does not necessarily serve this area.

Our schools serve grades nine through twelve. It is the policy of our district that transportation is provided for any student who does not live within a two-mile radius of the school he is attending. Bus stops are determined for each school each year dependent upon the number of students being served in an area.

At present, there is no plan for school construction in this area.

Sincerely yours,

KERN HIGH SCHOOL DISTRICT

Carl Berra

Carl Berra, Director
General Services

CB/ab

AN EQUAL OPPORTUNITY EMPLOYER

IV-D-10

ENGINEERING GEOLOGY

PROPOSED RIO BRAVO TENNIS RANCH

KERN COUNTY, CALIFORNIA

December 31, 1973

Harry R. Feder
Engineering Geologist

TABLE OF CONTENTS

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- Ground Water
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- Other Hazards

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CONCLUSIONS AND RECOMMENDATIONS

The proposed Rio Bravo Tennis Ranch is located in a seismically active area in which a Modified Mercalli earthquake intensity of IX can be anticipated. Any structures on the property should be designed to resist a MM intensity of at least IX.

Surface faulting does not appear to be present in the surface terrace alluvium in which the property is located, although subsurface faults are located both east and west thereof.

Terrace alluvium averaging about 150 feet in thickness on the property appears to be adequately permeable for construction of a leaching field for disposal of waste water.

Underlying the terrace alluvium of the property is impermeable Round Mountain silt.

GENERAL

Location - The proposed Rio Bravo Tennis Ranch, about 80 acres in area, is located in the south half of Section 4, T. 29 S., R. 29 E., MDB&M, about seven miles east of the City of Bakersfield. The property is located south of the Kern River and Ming Lake and north of Alfred Harrell Highway.

Topography - The property is located on gently inclined river terrace alluvium locally incised by gullys up to 50 feet deep which seasonally drain into the Kern River. The average property elevation is 600 feet, the Kern River 500 feet, the hill area commencing within 1,000 feet of the south limit of the property ascends to 900 feet. North of the Kern River, the rolling mountainous terrain rises to the summit of Round Mountain over 2,000 feet in elevation.

Surface Water - The Kern River is the principal surface water in the area. A small volume perennial (?) spring at the contact of terrace alluvium with Round Mountain silt is present near the south one-quarter corner of Section 3.

Ground Water - The level of the Kern River is 500 feet and alluvium beneath the property, based on projection, may

extend downward about 50 feet below the surface level of the Kern River.

Land Use - Kern River State Park, a recreational facility, is located north and east of the subject property. The park includes a 60 acre recreational vehicle camping area now under construction, Ming Lake, about 120 acres, and the Kern River Golf Course. The surrounding areas are used for grazing and contain oil fields and rock aggregate extraction and processing operations.

Rio Bravo Tennis Ranch - Tentative proposed developments include single and multiple family dwellings, limited commercial buildings, tennis facilities and golf course.

GEOLOGY

Stratigraphy - The subject property is located in the southeast portion of the San Joaquin Tertiary depositional basin. The local area contains about 4,000 feet of Tertiary sediments overlying the granite - metamorphic basement complex. Basement is exposed in the Sierra Nevada Range four miles east of the property on the east side of the Kern Gorge fault which has a vertical displacement of about 4,000 feet. The lithologic units at the subject property are as follows:

Alluvium	155' maximum
Round Mountain silt	700'
Nozu Olcese sands	1175'
Freeman-Jewett silt	1050'
Pyramid Hill-Vedder sands	500'
Walker formation	300'+
Basement	

Quaternary - Recent alluvium as differentiated from terrace deposits, is distributed along the Kern River and in gully channels. Terrace deposits consist of coarse, medium and fine clastics including boulder, sand and silt sized rock material, generally fairly well rounded, mostly poorly sorted and unconsolidated.

Structure - The property is located on a shallow, southwesterly dipping, faulted homocline as shown by surface geology, Exhibit I, and structural contours on top of the first sands, the Nozu-Olcese, Plate 2. The principal fault in the area located 1,500 feet west of the property is the northeasterly striking Tarabino (Barker Ranch) fault having a displacement of 450 feet down on the east on the top of the first sands. The north-northwesterly striking Round Mountain fault system with a displacement of 400 feet down on the east at Round Mountain oil field may continue southerly to the east of the property where displacement may be about 100 feet on the top of the first sands. Other faulting is probably present at depth within and in the vicinity of the property as indicated by contours

which may only be partially the result of an irregular top of the Nozu-Olcese.

Surface Geology - Detailed surface mapping was done in about five square miles for this report. The Tarabino fault is located north of the Kern River in surface exposures of Olcese sand in fault contact with Round Mountain silt. South, minor displacement is mapped in poor exposures of the Mon Bluff formation. The Round Mountain fault similarly displaces Olcese and Round Mountain silt north of the River and appears to displace the Mon Bluff formation, about 50 feet.

Faulting does not appear to affect either terraces or the alluvium of the Kern River.

Two minor (?) faults are mapped in very limited exposures of Round Mountain silt near the center of Section 3 and in the northwest quarter of Section 9.

The terrace deposits are mapped in four levels with Qt_1 about 20 feet above the Kern River and Qt_4 about 225 feet. The property is located on Qt_3, 100 feet above the Kern River.

GEOLOGIC HAZARDS

Seismicity - The subject property is located in a seismically active area as shown by pre- and post- 1952 earthquake

epicenters, Plates 3 and 4, Modified Mercalli zonation map 1952, Plate 5, and by published and unpublished mapping. 1952 earthquake epicenters, having a Richter magnitude of 6.1, are located six miles southwest and ten miles east-southeast of the property. About 30 additional epicenters are located within a 10 mile radius of the property. It is assumed for this report that the area continues to be seismically active and additional epicenters are located within a 10 mile radius of the property.

Surface rupture in alluvium overlying Kern River series described as "furrowing", the result of the 1952 Arvin-Tehachapi or Bakersfield earthquakes, was mapped by the writer in 1952 from Ant Hill oil field striking northwest through the southwest quarter of Section 9, south of subject property. This rupture is coincident with a more widespread postulated fracture and fault pattern shown on plates 6 and 7.

Zonation of earthquake intensities for the July 21, 1952 earthquake are shown on plate 5. The M.M. intensity in the local area may have been on the order of IX or less in 1952.

There was no significant damage in the local area of the 1952 earthquakes.

Other Hazards - Minor slumping is mapped at the west end of the property on the oversteepened east wall of the gully. Soil creep is noted south of the property on and immediately north of the steep slope. This does not affect the property. Subsidence of soils and formational units appears to present no unusual problems on the property. This conclusion and other conclusions in this report reflect geologic conditions prior to construction including earthwork and are subject to change as additional information is obtained.

Harry R Feder

Harry R. Feder

E.G. 801

References:

Crustal movement investigations. C.D.M.&G. Spl. Pub. 37, 1972.

Earthquakes in Kern County during 1952. Div. Mines, Bull. 171, 1955.

Crustal strain and fault movement investigations of fault and earthquake epicenters in Calif., C.D.W.R. Bull. 116-2, 1964


BAKERSFIELD SHEET.
CALIF DIV. MINES, 1955
REGIONAL GEOLOGY
PLATE 1
INCOMPLETE
BAKERSFIELD
KERN RIVER
KERN GORGE
PANAMA PEAK
PINE MOUNTAIN
R 26 E
R 27 E
R 30 E

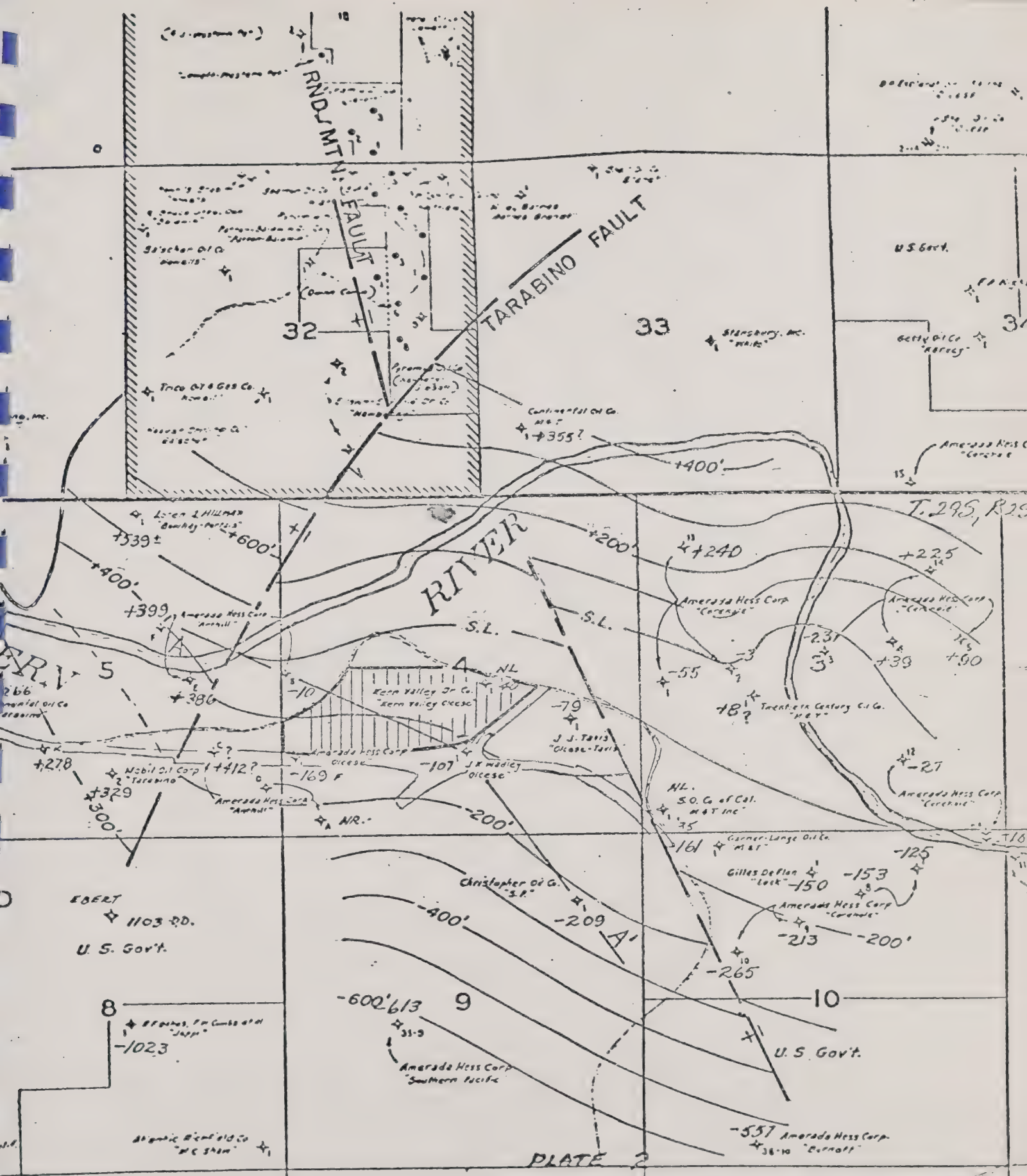
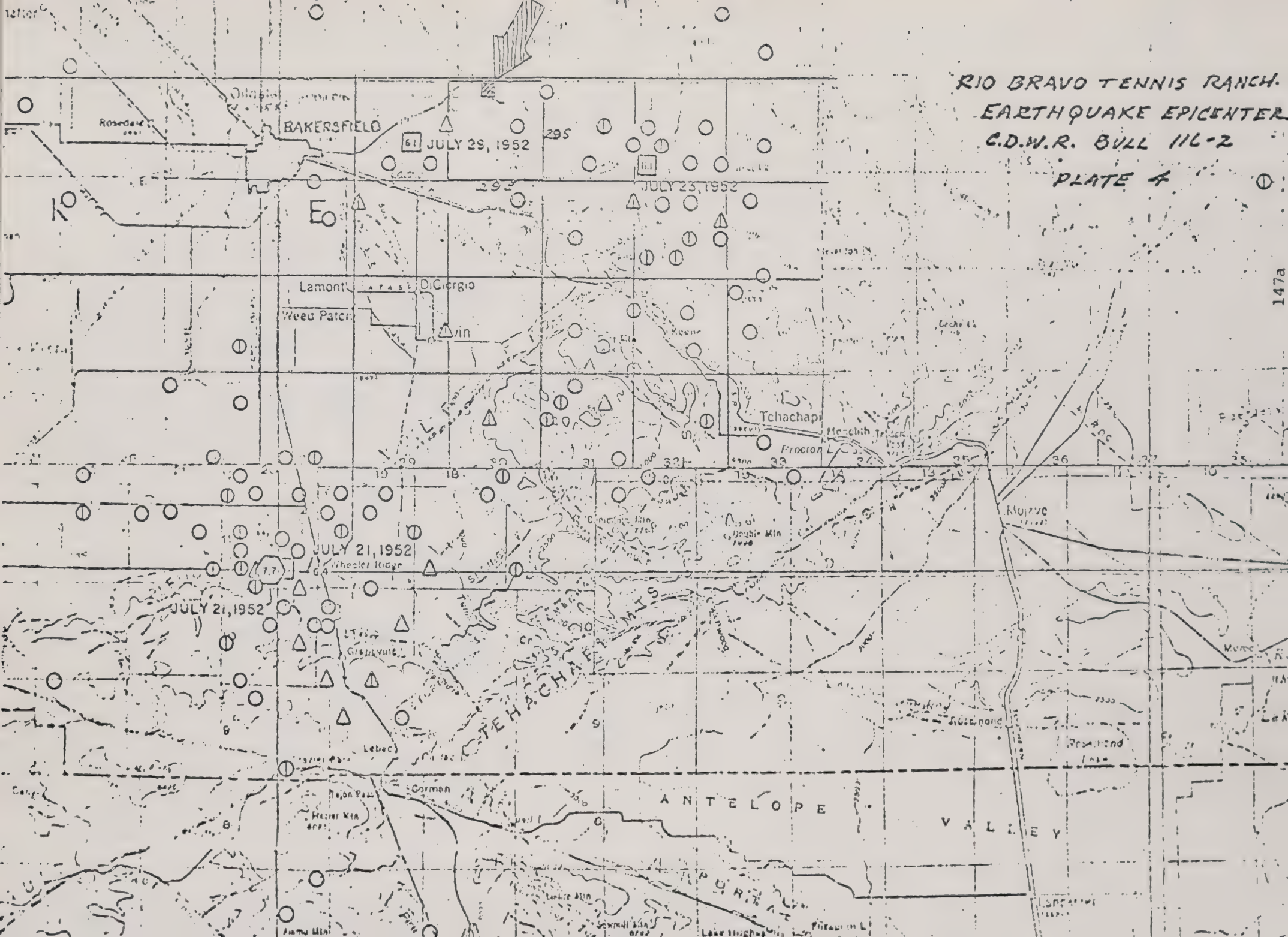

RND MTN FAULT
TARABINO FAULT
32
33
RIVER
S.L.
S.L.
4
5
NL
NL
NR
A
A'
T. 29S, R2
+339±
+600'
+400'
+399
+386
+278
+329
+300'
+412?
+200'
+240
+225
-231
+39
+90
-55
-3
-10
-79
-107
-169 F
-200'
-27
-125
-153
-150
-213
-200'
-265
-209
-400'
-602'613
-1023
-551
+355?
+48?
+161
-35
8
9
10
U. S. Gov't.
U.S. Gov't.
EBERT
1103 P.D.
Amerada Hess Corp "Carnahan"
Amerada Hess Corp "Carnahan"
Amerada Hess Corp "Carnahan"
Amerada Hess Corp "Carnahan"
Amerada Hess Corp "Arnold"
Amerada Hess Corp "Arnold"
Amerada Hess Corp "Southern Pacific"
Amerada Hess Corp. (Southern Pacific) (-15)
Amerada Hess Corp "Burnett"
Mobil Oil Corp "Tarabino"
Kern Valley Oil Co. "Kern Valley Oil Co."
Kern Valley Oil Co. "Kern Valley Oil Co."
J. K. Hadley "Oil Co."
J. K. Hadley "Oil Co."
J. J. Davis "Chase-Davis"
Christopher Oil Co. "S.P."
Gilles DeFlon "Lark"
Gardner-Large Oil Co. "M&T"
S.O. Co. of Cal. "M&T Inc."
Twenty-th Century Oil Co. "M&T"
Loren L. Hillman "Bentley-Hillman"
Trico Oil & Gas Co. "Arnold"
Continental Oil Co. "M&T"
Atlantic Richfield Co "M.C. Shaw"
Stansbury, Inc. "Wells"
Getty Oil Co "Kerney"
RIO BRAVO TENNIS RANCH & VICINITY
STRUCTURE ON FIRST SANDS
PLATE 2
145a



FIGURE 1. Instrumentally located epicenters, 1932 and 1934 to June 30, 1952, listed in table 1.

PLATE 3


RIO BRAVO TENNIS RANCH.
EARTHQUAKE EPICENTER
C.D.W.R. BULL 116-2
PLATE 4
BAKERSFIELD
JULY 29, 1952
JULY 23, 1952
JULY 21, 1952
JULY 21, 1952
Lamont
Weed Patch
DiGiorgio
Arvin
Tehachapi
Mojave
Wheeler Ridge
Grapevine
Lebec
Gorman
TEHACHAPI MTS.
ANTELOPE VALLEY
147a

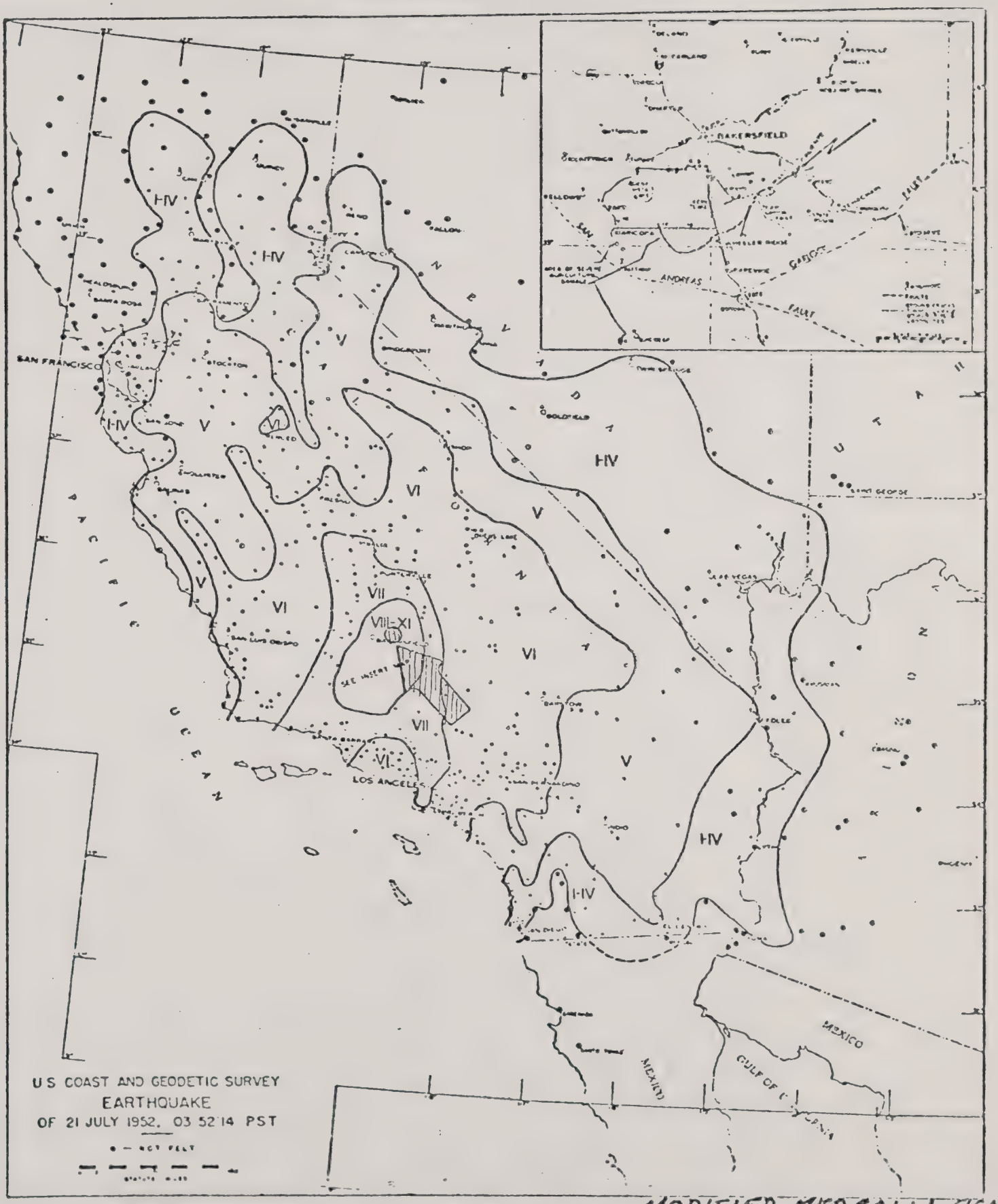


FIGURE 3.

MODIFIED MERCALLI SCALE
PLATE 5

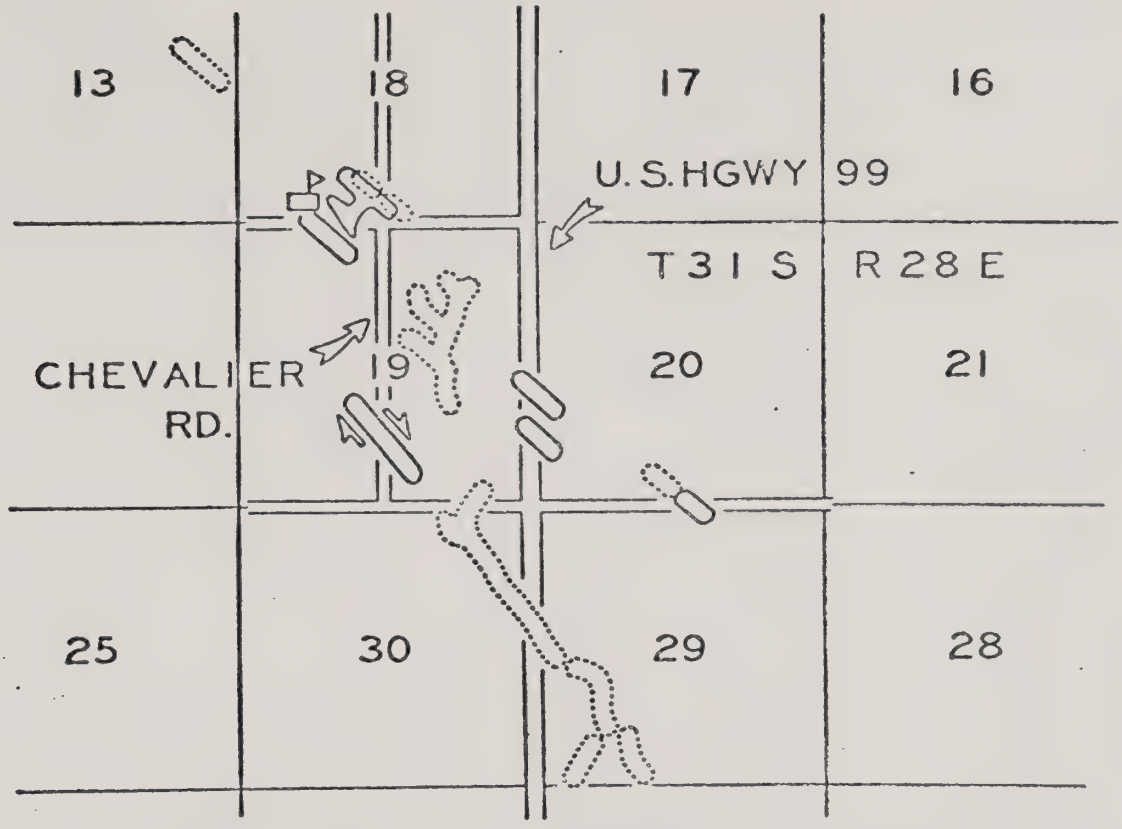


FIGURE 9. Fracture zones crossing U. S. Highway 99 and Chevalier Road.

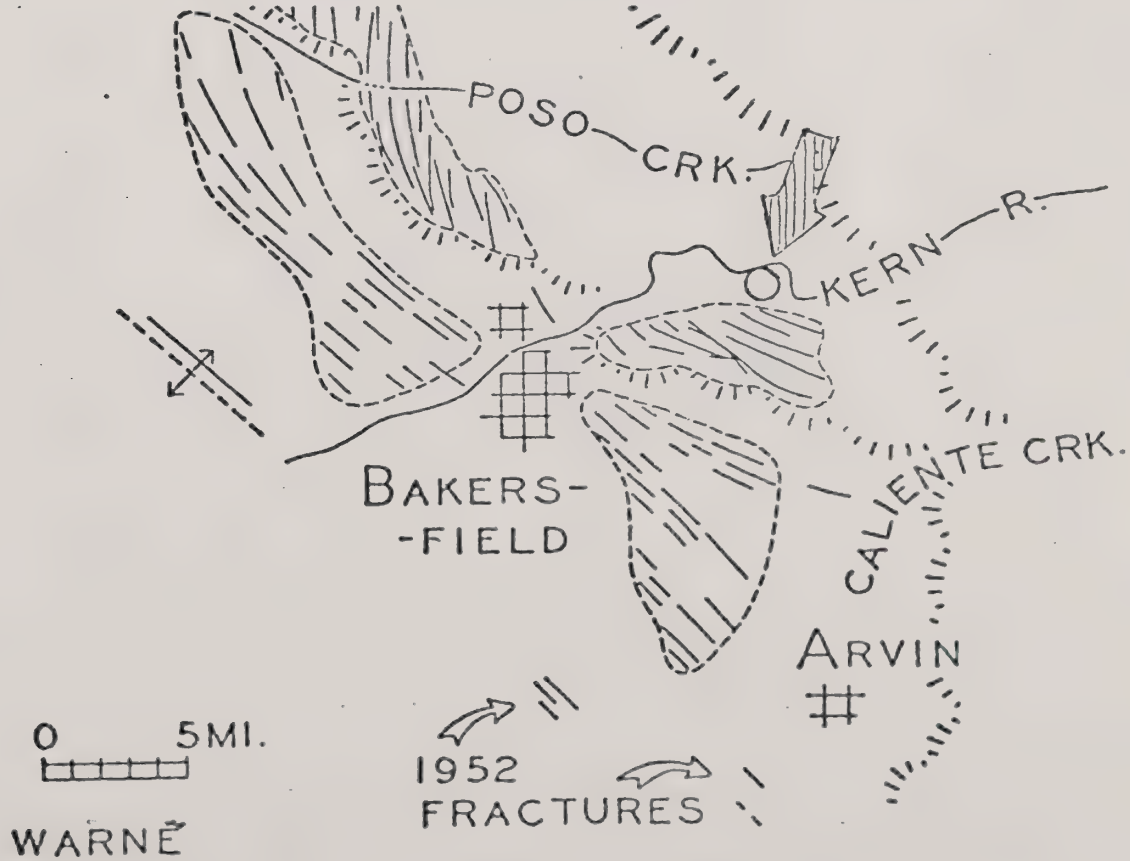
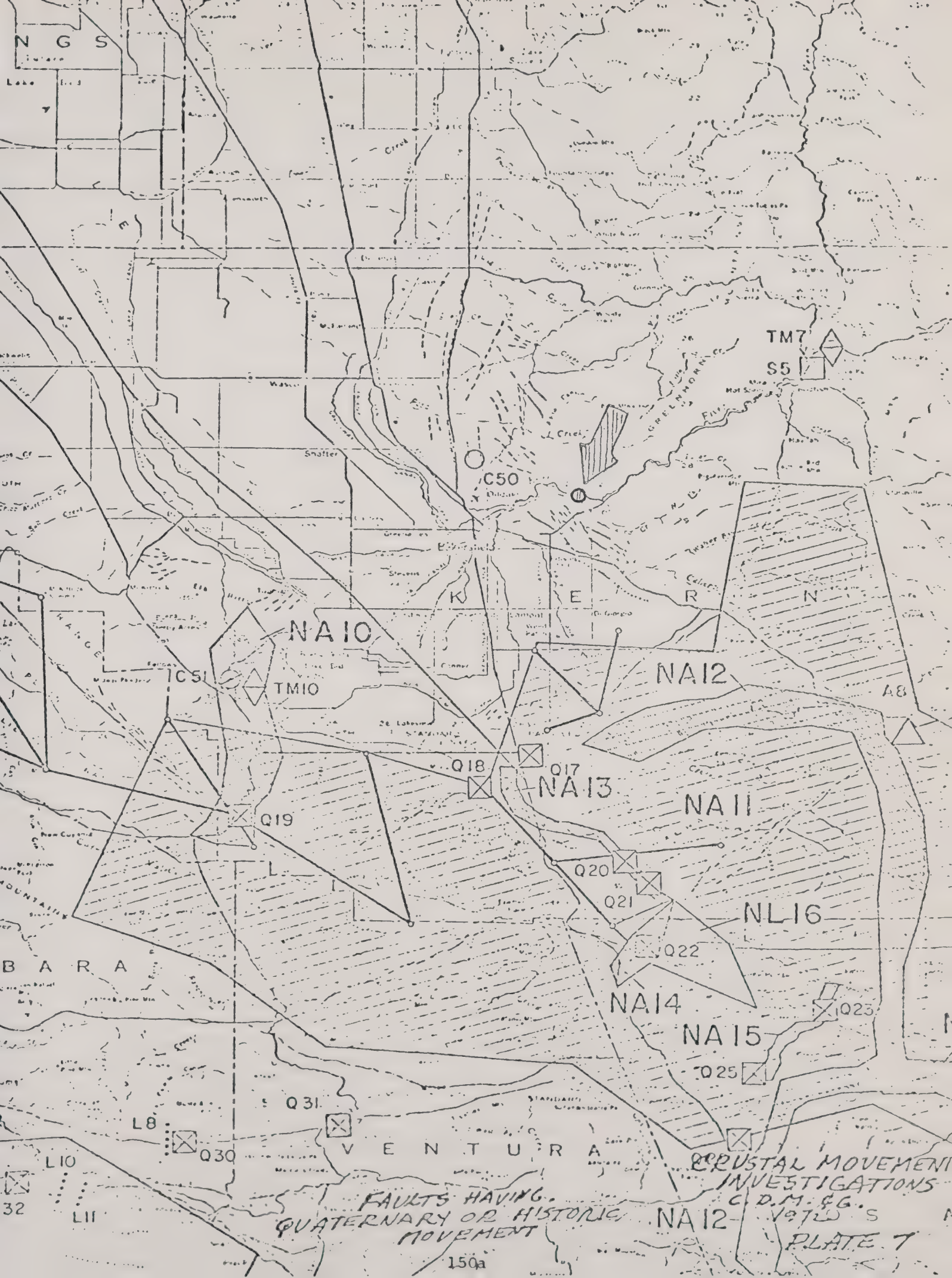
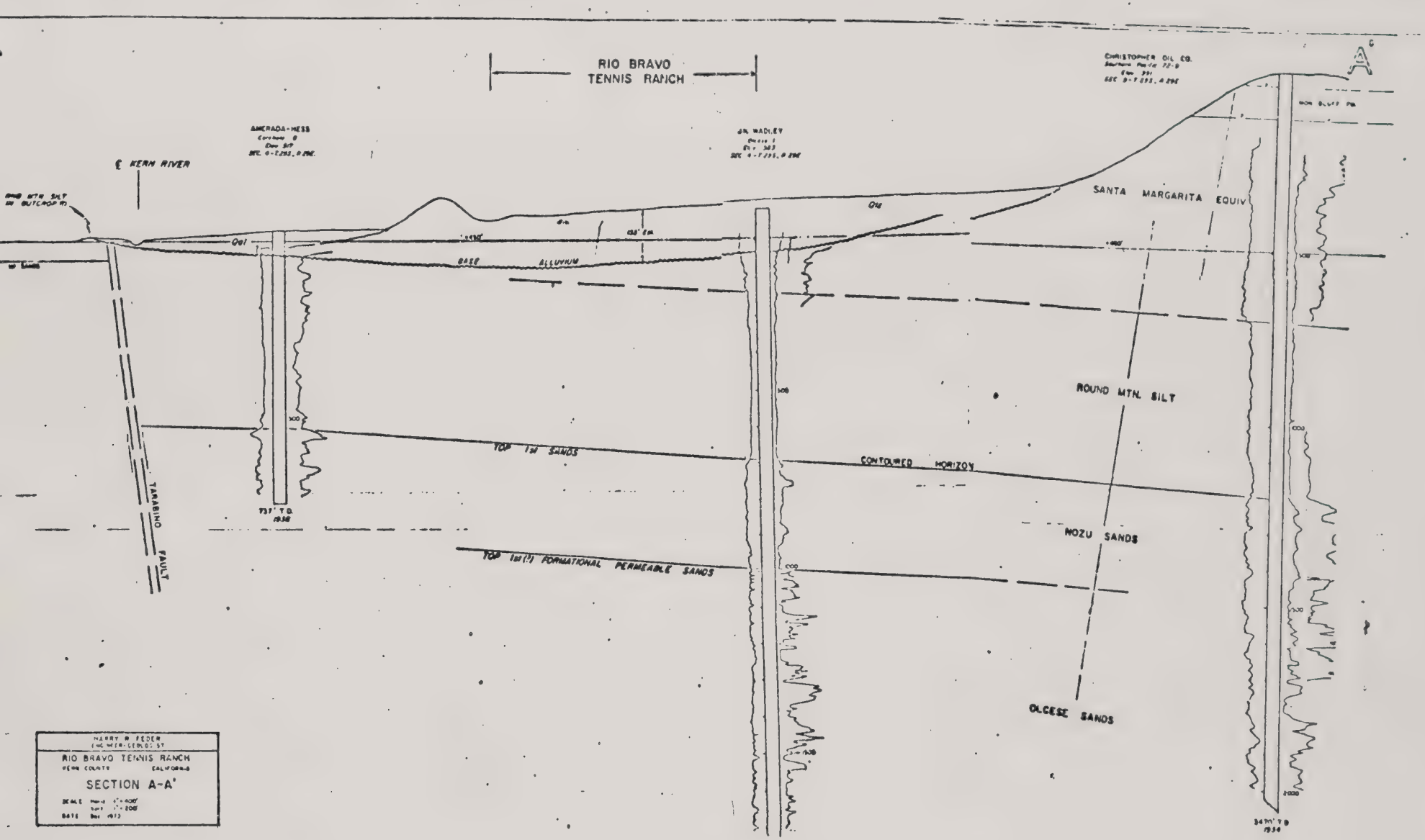


FIGURE 10. Relationship of 1952 fractures to ancient fracture pattern.

PLATE 6

EARTHQUAKES IN KERN COUNTY, 1952
DIV. MINES BULL. 171, 1955.


TM7
S5
C50
NA10
NA12
NA13
NA11
NL16
NA14
NA15
NA12
TM10
Q18
Q17
Q19
Q20
Q21
Q22
Q23
Q25
Q31
Q30
L8
L10
L11
VENTURA
FAULTS HAVING QUATERNARY OR HISTORIC MOVEMENT
CRUSTAL MOVEMENT INVESTIGATIONS
C.D.M.G.
PLATE 7


RIO BRAVO
TENNIS RANCH
℄ KERN RIVER
AMERADA-HESS
J.R. WADLEY
CHRISTOPHER OIL CO.
SANTA MARGARITA EQUIV
Qal
BASE ALLUVIUM
ROUND MTN. SILT
TOP 1st SANDS
CONTOURED HORIZON
NOZU SANDS
TOP 1st(?) FORMATIONAL PERMEABLE SANDS
OLCESE SANDS
TARABINO FAULT
737' T.D.
1938
HARRY W. FEDER
RIO BRAVO TENNIS RANCH
KERN COUNTY CALIFORNIA
SECTION A-A'

TELEPHONE
(805) 327-1486

2901 H STREET
BAKERSFIELD, CALIFORNIA 93301



File #9098

IV-D-11

July 17, 1972

Mr. George W. Nickel, Jr.
4043 Stockdale Highway
Bakersfield, Calif. 93309

Dear Mr. Nickel:

Enclosed is the complete Soils Report and Foundation Investigation for the Rio Bravo Tennis Ranch.

Please contact us if you have any questions regarding the report.

Very truly yours,

RICKETT, REAVES & WARD

H. Ronald Lampson

H. Ronald Lampson
R.C.E. 17027

hrl:lmn
enc.
cc: Mr. Ken Ramsey w/ enc.
Mr. Cliff Harding " "
Mr. Jim Davidson " "

SOILS REPORT

&

FOUNDATION INVESTIGATION

on

RIO BRAVO TENNIS RANCH SITE

near
Ming Lake
Eight Miles Northeasterly of
Bakersfield, California

for

RIO BRAVO TENNIS RANCH

July 14, 1972

Rickett, Reaves & Ward
SOILS ENGINEERING, INC.

CHARLES M. BONNEAU
VICE PRESIDENT

TELEPHONE
AREA CODE 805
327-1486

RICKETT, REAVES & WARD
SOILS ENGINEERING, INC.
2901 H STREET
BAKERSFIELD, CALIFORNIA 93301

File L1636

SOILS REPORT
&
FOUNDATION INVESTIGATION
on
Rio Bravo Tennis Ranch Site
near
Ming Lake
Eight Miles Northeasterly of
Bakersfield, California
for
Rio Bravo Tennis Ranch

July 14, 1972

SCOPE: This investigation was planned to provide - 1. Data from which earthwork shrinkage factor could be calculated, 2. Identification of soil types to be encountered in excavations for sunken Exhibition Court & swimming pool, 3. Suitability of soils for construction of tennis courts, 4. Location of soil materials suitable for septic tank leach fields, 5. Recommendations for soil bearing pressures and footing design for proposed structures.

SITE CONDITIONS: The site is on a small rise approximately 2,000 to 2,500 ft. south easterly of Kern River channel and is more than eighty feet higher than the river channel (data from Rio Bravo Ranch Quadrangle, U.S.G.S.) The surface slopes slightly westerly and the surrounding area drops quickly on the east, north and west. The area is clear and open without trees or brush. When borings were made, June 1, 1972, there was a small amount of grass on the site. It should be removed prior to grading.

An abandoned oil well was noted in the tennis court area southerly of boring No. 2. It was accompanied by a small dyked sump but there was no evidence of drill mud or other objectionable material. There was no other evidence of previous structures, excavations, septic tanks or cesspools, orchards, trees, old fills, or other items that would require special attention. The area has not been graded or leveled.

STRUCTURAL CONSIDERATIONS: Proposed structures are to be one and two story, located generally as shown on the attached map. Excavations are to be made for a sunken exhibition court with bleachers and for a swimming pool.

GEOLOGY AND DRAINAGE: The site is on alluvial materials of considerable depth. Heavy gravels of river bed type were found at 7-1/2 feet in boring No.1 and 11 feet depth in boring No.10. Other borings showed fine medium, and coarse clean sands at depths of 4 to 8 feet except at borings No.5, No.11 & No.12 where silts continued to 13 feet at No.11 and silty fine sands with silt layers to 16-1/2 feet at No.12. These materials indicate the deposit may be a part of or deposited from the pleistocene Kern River formation of the hills to the south. They did not appear to be of the Round Mountain type silt and the lack of gravel indicates they were not deposited by recent river flows.

No natural drainage courses cross or are intercepted by the site. Only local surface drainage need be considered. Local grading should be designed to provide positive free drainage away from all sides of proposed structures.

WATER TABLE: The water table is at too great a depth to be of any concern to proposed structures. No free water or increase in moisture content was found to the 20 feet depth bored. In fact, the natural moisture content decreased with depth.

SOIL TYPES: Near surface soils were, in general, more silty and became cleaner and coarser with increasing depth. The siltier soils classify as ML and the deeper soils classify as SM with some SP (Boring No.4 at 8 ft. depth) by the Unified Soils Classification System. Near surface soils are moderately plastic and moderately expansive in the two story building area. Soils at boring No.12 were moderately water-sensitive to eleven feet depth, i.e. consolidation samples exhibited additional compression when wetted at given load.

SOIL DATA ETC: Recommended specifications for earthwork, tables of soil test data, logs of test borings, and a location sketch are attached to this report. Soil test data was obtained by applicable ASTM test procedures.

- CONCLUSIONS AND RECOMMENDATIONS -

Shrinkage Factor: The cut vs. fill ratio will vary and can be determined by combining the following:

a. Surface and near-surface soils on the site vary from the north and northwest portion of the area to the south and southeast portion. It will be sufficient to consider the area in two parts, the tennis court area and the building area. No exact delineation can be made, but this breakdown should yield good average values.

b. All surfaces to receive fill and all grades exposed by cut must be scarified, wetted and compacted to 90% relative density in tests taken 6" below the surface. Allow for this compaction to produce 0.15' of subsidence in the tennis court area and 0.25' of subsidence in the building area. Add total of this volume to fill requirements.

c. For excavated material to be used as fill, allow 1.15 c.y. of cut in tennis court area to produce 1.00 c.y. of fill, and 1.30 c.y. of cut in building area to produce 1.00 c.y. of fill. (The over-all shrinkage factor will depend on the combination of these values with the extra fill volume requirement obtained from b., above.)

Excavations: Excavation for sunken exhibition court should present no problem down to 9-1/2 feet depth (elev.= 594). Side slopes will be safe at 1-1/2:1. This is undoubtedly a steeper slope than will be needed. Flatter design slopes will, of course, be satisfactory. Below this elevation, clean dry sands may tend to run into the excavation. If this should occur, a light dampening with water should be sufficient to stabilize the material during construction. Excavation for the pool will be essentially the same except that sand starts at 6-1/2 feet depth (elev. 592). Sides of the pool excavation should stand vertically during construction provided the hole isn't open too long and running sand doesn't undermine side walls. If this should occur moistening the sand may help but if the excavation goes very far into the sand some other means of holding it in place will probably be necessary.

Tennis Courts: All soils on the site will be satisfactory for making grade in the tennis courts except the near surface material characterized by white streaks in the vicinity of borings No.12 & No. 13. If cut is made in this area the excavated material should be used as fill in a non-structural area. Soluable sulphate in the area was practically nil and there should be no difficulty with paving materials or concrete.

Leach Fields or Seepage Pits: Highly pervious materials were found at five to six feet depths in borings No. 1, 2, 3, 4, 9 & 10. Leach fields could be founded in type 1 or type 2 materials in these areas. Reduction in leach field area required would justify the two or three feet extra excavation required to reach these materials. Seepage pits could probably also be used. A pilot hole should be put down to verify sufficient depth of sand if a seepage pit site is selected.

Footing Design: Footings for one-story structures may be placed at a minimum depth of one foot below lowest finished adjacent grade. Footings for the two-story structure must be a minimum of two feet below existing natural grade or 18" below lowest adjacent finished grade, whichever is lowest; i.e. if 6" or more of cut is taken from the building area, footings may be placed 18" below lowest adjacent finished grade. Exterior footing trenches for two story building

should be excavated a minimum of two feet wide in order to obtain maximum effect of pre-consolidation of footing trench bottoms described below. After pre-consolidation is accomplished, these trenches may be filled with concrete to their full width or footing forms may be used to construct footings to minimum design width. All interior footings and exterior footings of one story structures should be excavated a minimum of sixteen inches in width. All footings, interior and exterior should be reinforced with two no.4 steel reinforcing bars, one placed near the top (1-1/2" down) and one near the bottom (2" above bottom of trench).

PROCEDURE FOR COMPACTION OF FOOTING TRENCH BOTTOMS: Footing excavations shall be saturated and pre-consolidated before placing concrete. Saturation shall be accomplished by flooding footing excavations for twenty-four hours if percolation is fast, or until percolation of at least two feet of water into excavations if percolation is slow. (i.e. - An 8" excavation would be filled and allowed to percolate three successive times.) Place small dykes in continuous trenches to prevent water from draining to more pervious areas.

Footing trench bottoms shall be compacted by four passes with a 1,000 pound mechanical hammer. The hammer shall be used in accordance with the following procedures:

1. Allow moistened material to drain to near optimum moisture content before commencing compaction work.

2. Avoid consecutive blows on the same spot.

3. Cover the width of the excavation by single blows, overlapping only when necessary due to dimensions.

4. Move ahead one-half width of hammer head and repeat step 3, continuing to end of run of excavation. This will result in 2 complete coverages.

5. Repeat steps 3 & 4 either by working in reverse direction or returning to start of run and working forward again.

6. Excavations will be deepened by the above process. In order to avoid extra depth which would require more concrete, trenches may be originally excavated 6 inches shallower than design depth. The effects of consolidation plus removal of loose material produced by hammer action should come close to producing design grades.

The machine mentioned above should have a 1,000 pound hammer, using a 160 pound, 1 foot square head, and 6 foot free fall, delivering approximately 7,000 ft. lbs. of energy per blow. These dimensions are intended to describe available machines and a few pounds variation will not be important. However, the variation should not be more than 10%.

Soil-Bearing Pressure: Footings placed as described above may be designed for soil-bearing values up to -

2,000 lbs. per sq. ft.

This value is for the total of dead loads plus live loads acting most of the time and should include wind and/or seismic loads. Roof live loads may be neglected.

Drainage: Positive free drainage must be provided to carry water away from all foundation areas. Any planters placed near buildings should be provided with sealed bottoms and free drainage away from structures. Pool decking should be water-proof and designed with drainage to carry splash and wash-down water away to prevent saturation of soils under decking and around pool walls. No french drains or other seepage devices should be used around edges of decking. Sidewalks, curbs, and other improvements near structures must be designed so that they do not trap or pond water. No seepage pits, leach fields or other types of water disposal units should be placed within 50 feet of structures.

Slabs on Grade: No water pipes under pressure should be placed beneath floor slabs. Sewer lines should be first quality and should lead out beyond foundations by the shortest route. If floor slabs are used in the two story structure they should be placed on a 4 inch thick layer of crushed rock (or class 2 aggregate, Calif. Hwy. Spec.) which in turn should be covered with a polyvinylchloride membrane (min. thickness 6 mils) and a one inch thick layer of sand. Sand should be dampened immediately before pouring concrete. Floor slabs in the one-story area may be protected by the membrane and sand only. The rock layer may be deleted.

Settlement: If the above recommendations are followed, the probability of differential settlement sufficient to cause structural damage will be remote. However, should some unforeseen occurrance cause massive saturation of sub-soils, moderate differential settlement could be possible, but the probability of structural damage sufficient to require more than cosmetic repairs would be practically nil.

This is an engineering report of our opinions and conclusions. It is not an insurance policy or a guarantee against future occurences from either unnoticed or unforeseen causes.

Respectfully Submitted,

Rickett, Reaves & Ward
SOILS ENGINEERING, INC.

C.M. Bonneau
R.C.E. 10664

CMB:jb

RECOMMENDED SPECIFICATIONS FOR EARTHWORK

SITE GRADING

1. GENERAL DESCRIPTION. This item shall consist of all clearing and grubbing, removal of existing structures, preparation of land to be filled, filling of the land, spreading, compaction and control of the fill, and all subsidiary work necessary to complete the grading of the filled areas to conform with the lines, grades and slopes as shown on the accepted plans.

2. CLEARING, GRUBBING AND PREPARING AREAS TO BE FILLED.

   (a) All tin cans, glass and other non-combustible rubbish shall be removed from the site and disposed of.

   (b) All timber, logs, trees, brush and other combustible rubbish shall be removed, piled and burned or otherwise disposed of so as to leave the areas that have been disturbed with a neat and finished appearance, free from unsightly debris.

   (c) All vegetable matter shall be removed from the surface upon which the fill is to be placed, and the surface shall then be plowed or scarified to a depth of at least six inches (6"), and until the surface is free from ruts, hummocks or other uneven features which would tend to prevent uniform compaction by the equipment to be used.

   (d) After the foundation for the fill has been cleared and plowed or scarified, it shall be thoroughly compacted to a depth of at least six inches (6") in accordance with specifications for compacting fill material in Paragraph 4.

3. EXCAVATION. Excavation shall be material which is excavated for the purpose of making fills to grade the site to the elevations indicated on the plans. This material shall be obtained from areas shown on the grading plans as cut areas. The cut areas shall be excavated to within 0.1 foot, plus or minus, of the finish grades shown on the accepted plans. The finished surface of cut areas shall be graded or bladed to a smooth and uniform surface.

4. PLACING, SPREADING, AND COMPACTING FILL MATERIAL.

   (a) The fill material shall be placed in layers which, when compacted, shall not exceed six inches (6"). Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to insure uniformity of material in each layer.

(b) When the moisture content of the fill material is below that specified by the Soils Engineer, water shall be added until the moisture content is as specified.

(c) When the moisture content of the fill material is above that specified by the Soils Engineer, the fill material shall be aerated by blading or other satisfactory methods until the moisture content is as specified.

(d) After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to not less than ninety percent (90%) of maximum density in accordance with ASTM Density Test No. D1557-58T modified to 3 layers (25 blows each layer - 10-lb. hammer - 18" drop). Compaction shall be by equipment of such design that it will be able to compact the fill to the specified density. Compaction shall be accomplished while the fill material is at the specified moisture content. Compaction of each layer shall be continuous over its entire area and the equipment shall make sufficient trips to insure that the desired density has been obtained.

(e) Field density tests shall be made by the Soils Engineer. The compaction of each layer of fill shall be subject to testing. Where sheepsfoot rollers are used the soil may be distrubed to a depth of severl inches. Density tests shall be taken in the compacted material below the disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below the required (90%) density, the particular layer or portion shall be re-worked until the required density has been obtained.

(f) The fill operation shall be continued in six inch (6") compacted layers, as specified above, until the fill has been brought to within 0.1 foot, plus or minus of the finished slopes and grades as shown on the accepted plans. The finished surface of fill areas shall be graded or bladed to a smooth and uniform surface.

(g) No fill material shall be placed, spread or compacted while it is frozen or thawing or during unfavorable weather conditions. When work is interrupted by weather conditions, fill operations shall not be resumed until the Soils Engineer indicates that moisture content and density of previously placed fill are as specified.

TABLE 1

SIEVE ANALYSIS

Boring No.	Depth	% Passing U. S. Standard Sieve Sizes 1½"	3/4"	3/8"	#4	#10	#20	#40	#130	#200
1	9'	91	82	77	64	61	48	30	13	10
1	9' (Passing #4 Fraction)				100	95	75	47	20	16
4	8'				99	91	61	29	6	4
9	8'				99	98	80	44	9	8
12	2' to 3'				100	99	98	96	83	72
13	3'					100	99	98	83	69

TABLE 2

MAXIMUM DENSITY - OPTIMUM MOISTURE
(ASTM D1557-66T, modified to 3 layer)

Location	Depth	Optimum Moisture Content % of dry wt.	Maximum Density lbs./cu.ft.
45' W. of Boring #2	0 to 6"	9.0	125.8
6' SW of Boring #3	1" to 7"	6.8	125.3
12' W of Boring #11	6" to 12"	10.9	122.5
Boring #12	2' to 3'	15.7	112.5
Boring #12	5' to 6'	12.0	111.8
Boring #12	8' to 9'	12.3	104.6

TABLE 3

IN-PLACE NATURAL DENSITY

Location	Depth	Maximum Density lbs./cu.ft. (Table 2)	Natural Moisture Content % of dry wt.	Natural Dry Density lbs./cu.ft.	% of Maximum Density
45' W of Boring #2	0 to 6"	125.8	1.9%	102.1	81%
6' SW of Boring #3	1" to 7"	125.3	1.6%	107.2	86%
12' W of Boring #11	6" to 12"	122.5	2.4%	86:5	71%
Boring #12	5' to 6'	111.8	5.9%	93.7	84%
Boring #12	8' to 9'	104.6	4.5%	85.0	81%

TABLE 4

IN-PLACE MOISTURE CONTENT

Boring No.	Depth	Moisture Content % of dry wt.	Boring No.	Depth	Moisture Content % of dry wt.
1	2'	3.9	9	8'	1.8
1	4'	6.6	11	7'	5.1
1	7'	2.8	12	5'	7.2
1	9'	2.3	12	6'	4.6
1	10'	1.6	12	8'	4.4
2	4'	6.7	12	9'	4.6
3	4'	4.9	12	12'	7.4
3	8'	1.0	12	16'	5.8
4	5'	3.2	12	18'	3.3
4	8'	1.3	12	20'	4.0
5	2'	4.6	13	2'	8.5
5	10'	7.0	13	3'	9.6
7	10'	1.9	13	10'	3.9
8	5'	5.2	13	17'	5.0
8	15'	2.8	13	20'	4.2

TABLE 5

ATTERBURG LIMITS

Boring No.	Depth	Liquid Limit	Plastic Limit	Plasticity Index
12	2' to 3'	30%	16%	14

TABLE 6

DIRECT SHEAR
(Sample remolded to 90% of 112.5 pcf at 15.7% moisture)

Boring No.	Depth	Expansion (at 390 p.s.f.) %/% Moisture Change	Angle (o) of Internal Friction	Cohesion p.s.f.
12	2' to 3'	.041	8°	1060
12	2' to 3'	.041	15°	587

TABLE 7

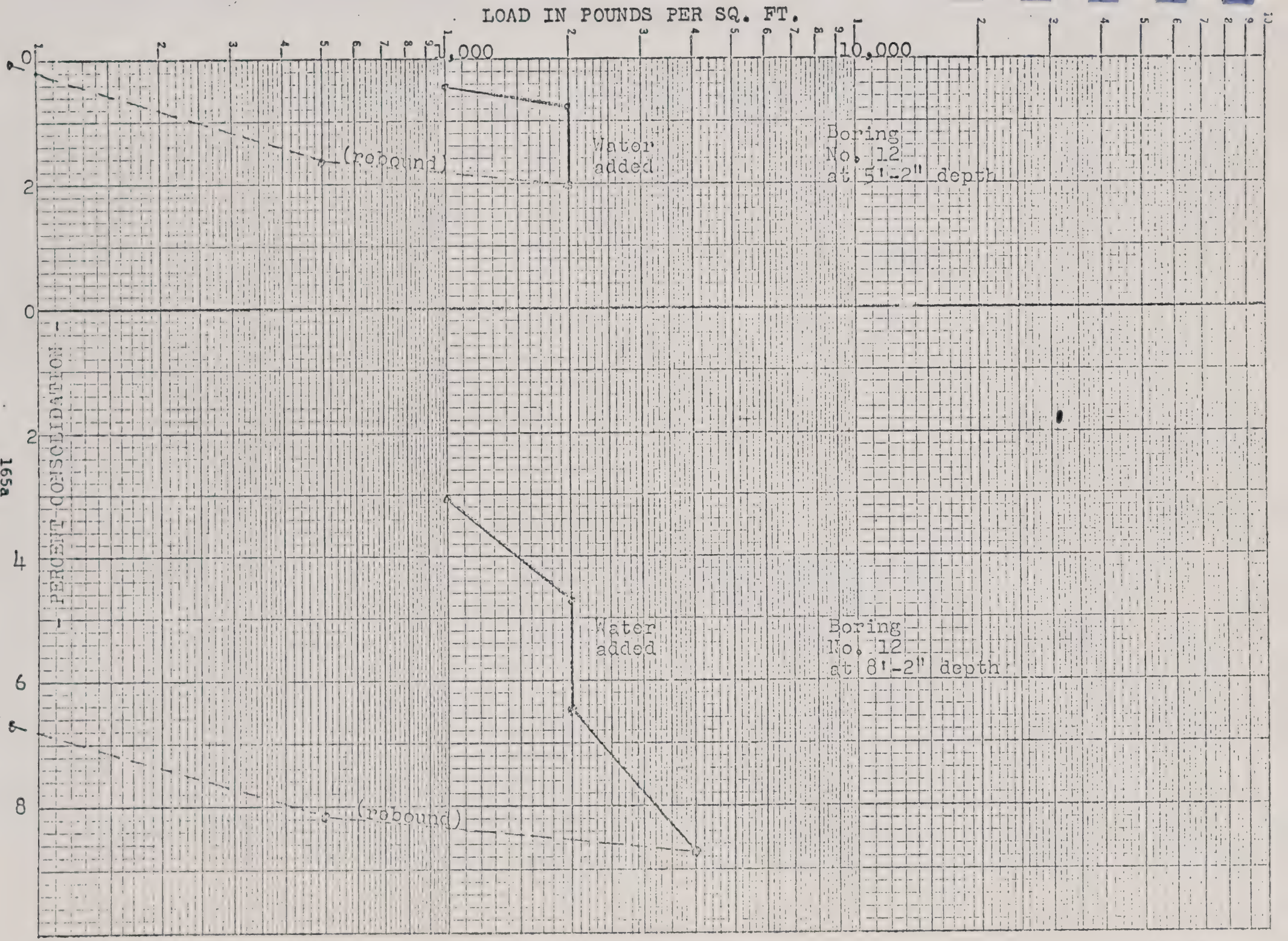
CONSOLIDATION
(Undisturbed Samples)

Boring No.	Depth	1000 psf dry	2000 psf dry	2000 psf wet	4000 psf wet	Rebound	Moisture Content % of dry wt. Before	After
12	5'2"	0.43%	0.73%	2.01%		1.91%	7.2	25.6
12	8'2"	3.07%	4.70%	6.27%	8.73%	2.00%	4.4	27.5

TABLE 8

SOLUBLE SULFATE

Location	Percent Soluble Sulfate
45' W of Boring #2	0.0036%
12' W of Boring #11	0.0038%



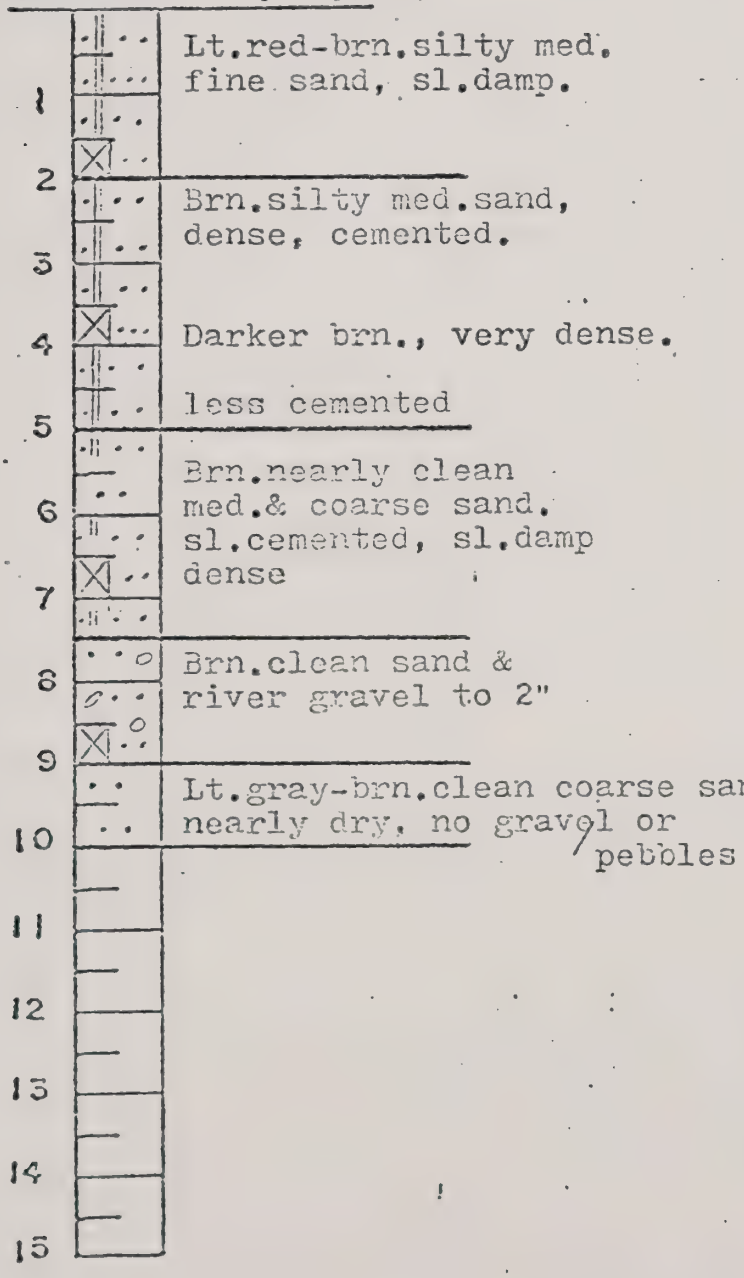
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- CONSOLIDATION TESTS -

L1636

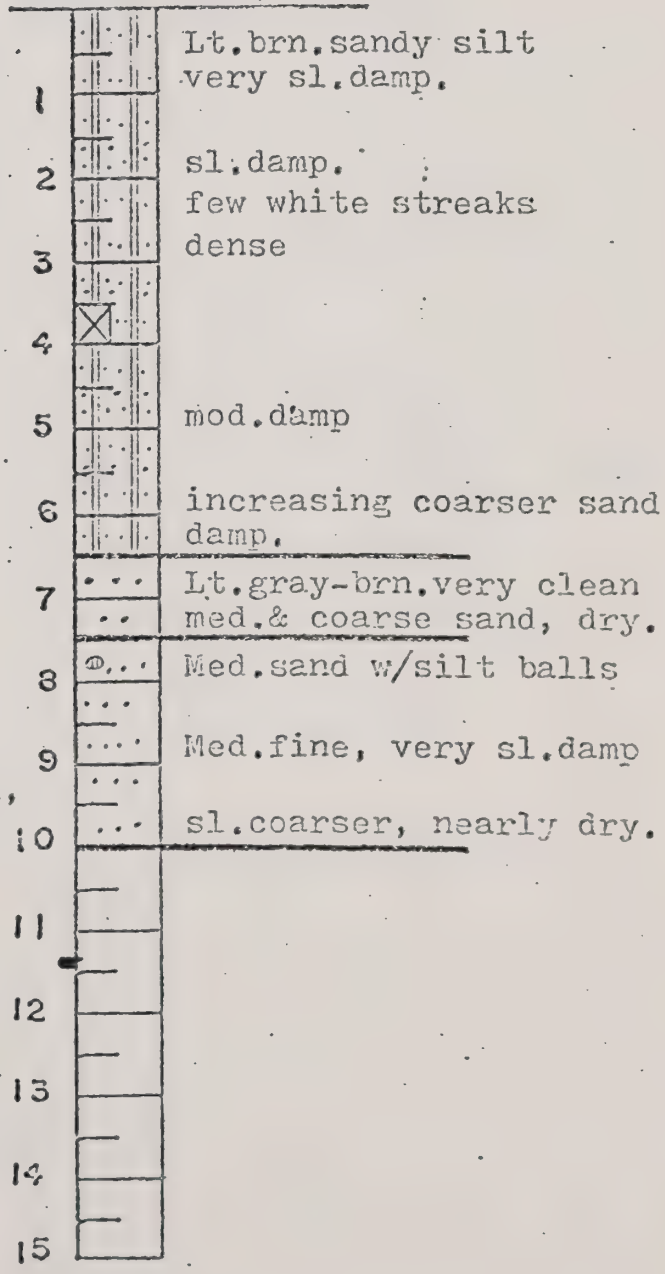
TEST BORING LOG
Hole No. 1

Surface Elev. = 598.7



TEST BORING LOG
Hole No. 2

Surface Elev. = 601.2



TEST BORING LOG
Hole No. 3

Surface Elev. = 599.9

1	Lt.brn.sandy silt sl.damp.
2	white streaks, mod.dense.
3	cemented
4	
5	Lt.gray-brn.silt and very fine sand, gritty sl.damp.
6	Mod.dense, sl.cemented
7	Lt.gray brn.clean med.coarse sand nearly dry.
8	
9	very clean, medium sand.
10	
11	
12	
13	
14	
15	

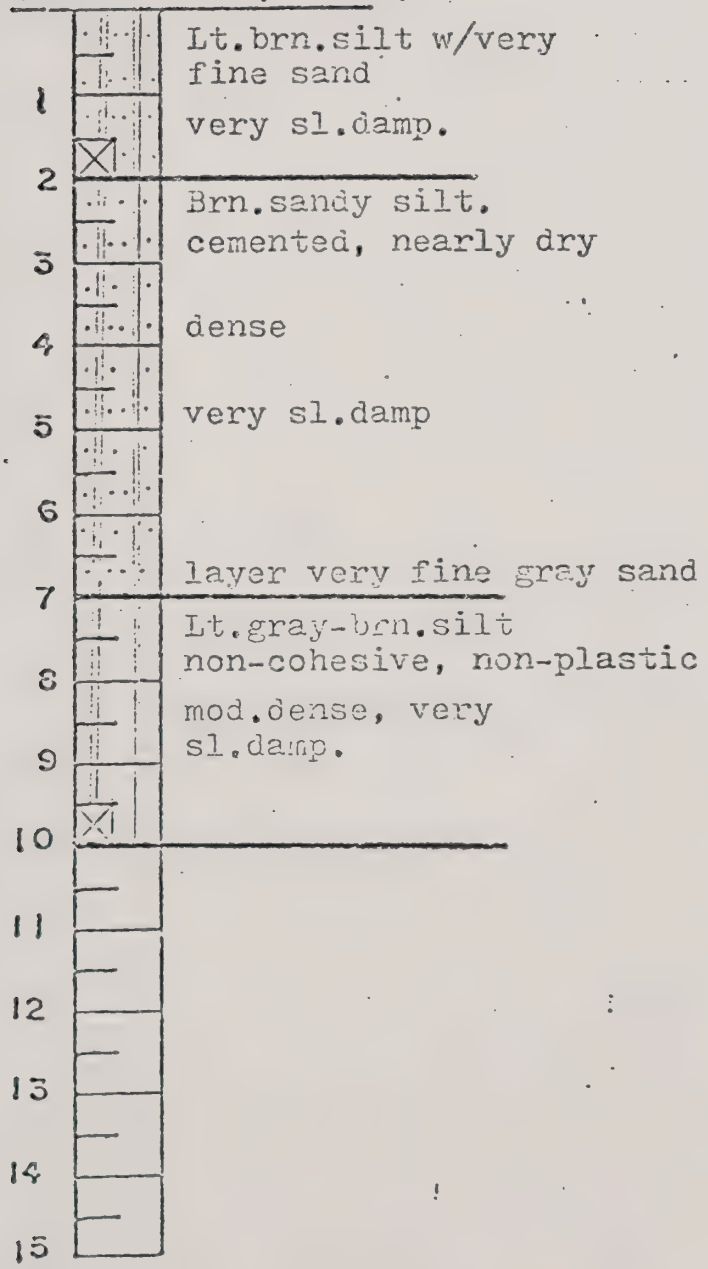
TEST BORING LOG
Hole No. 4

Surface Elev. = 599.0

1	Lt.brn.sandy silt, dry
2	Lt.brn.sand & silt, dry
3	Brn.sandy silt, cemented, dense, white streaks, sl. damp.
4	
5	Lt.brn.silt & fine sand, cemented
6	Lt.brn.& reddish streaks, sl.silty med.sand nearly dry.
7	cleaner, coarser.
8	Clean coarse sand reddish-brn.
9	few pebbles
10	coarser, nearly dry.
11	
12	
13	
14	
15	

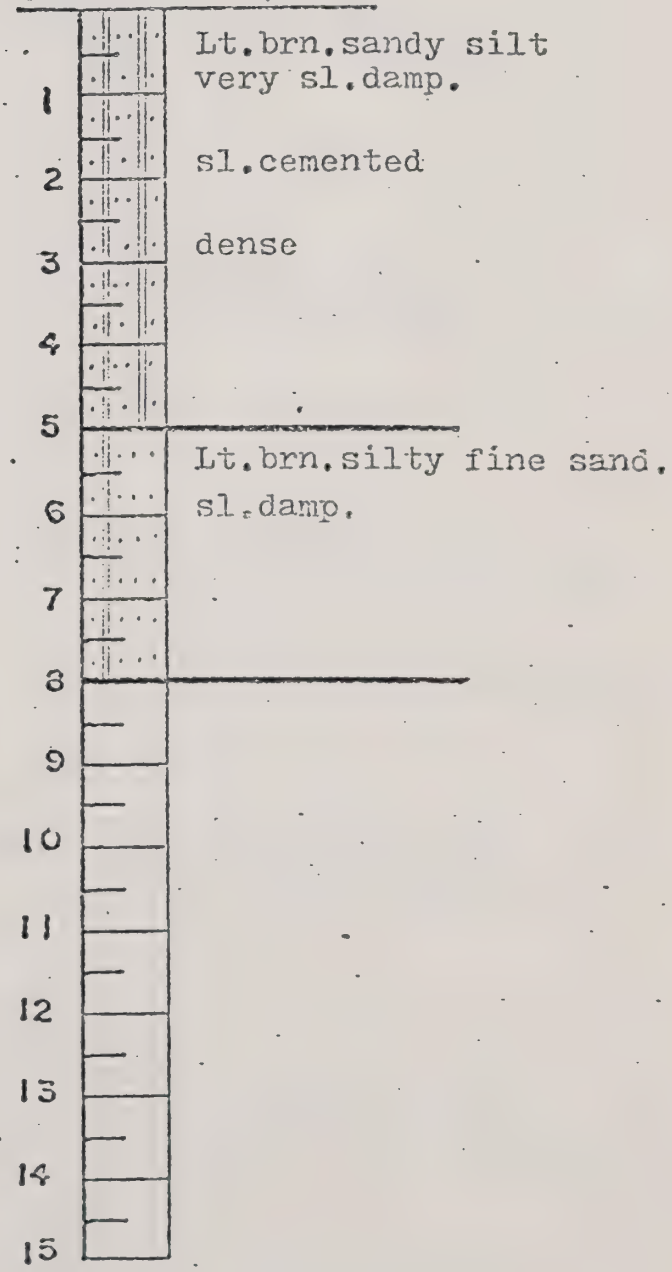
TEST BORING LOG
Hole No. 5

Surface Elev. = 600.0



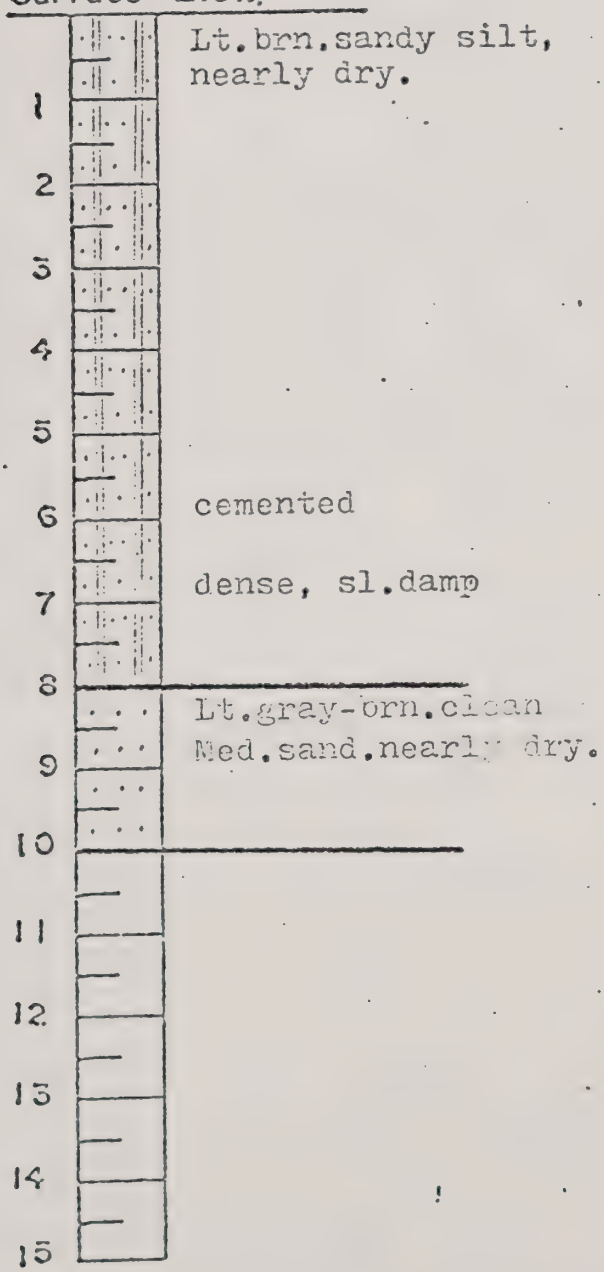
TEST BORING LOG
Hole No. 6

Surface Elev. = 601



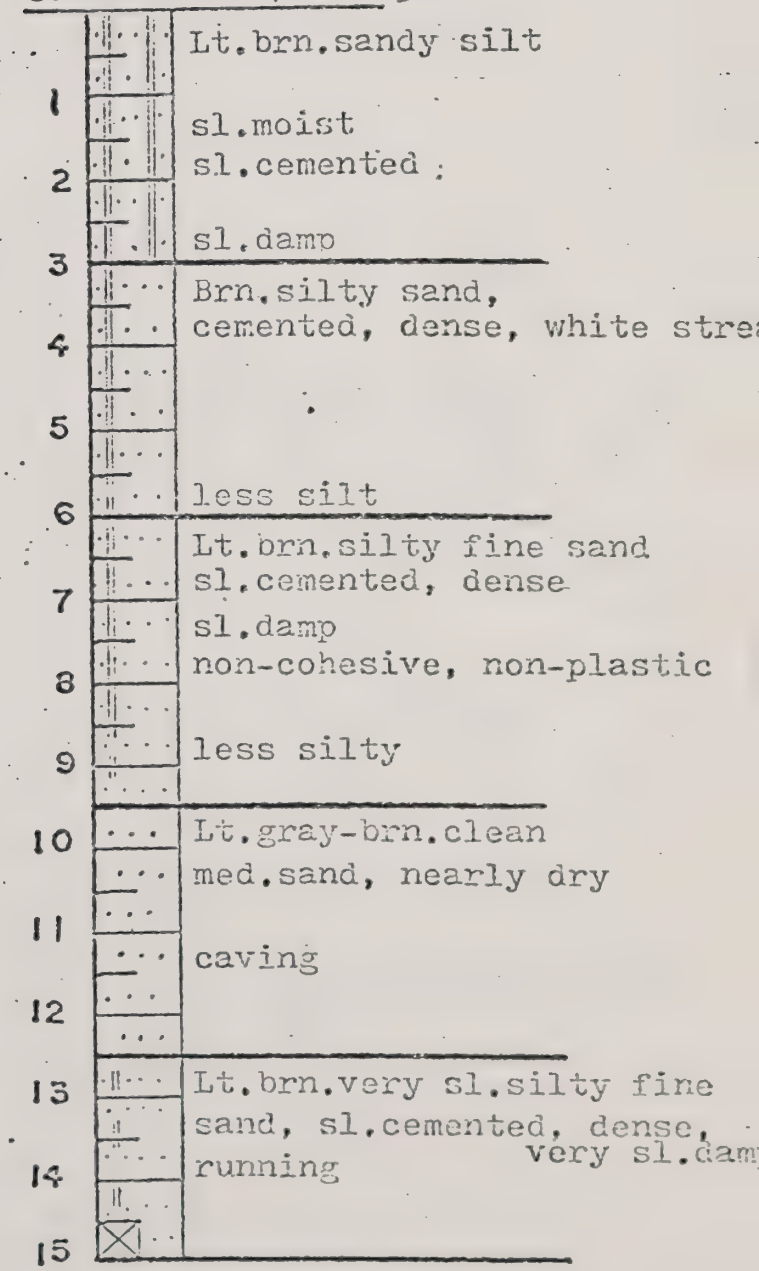
TEST BORING LOG
Hole No. 7

Surface Elev. = 601



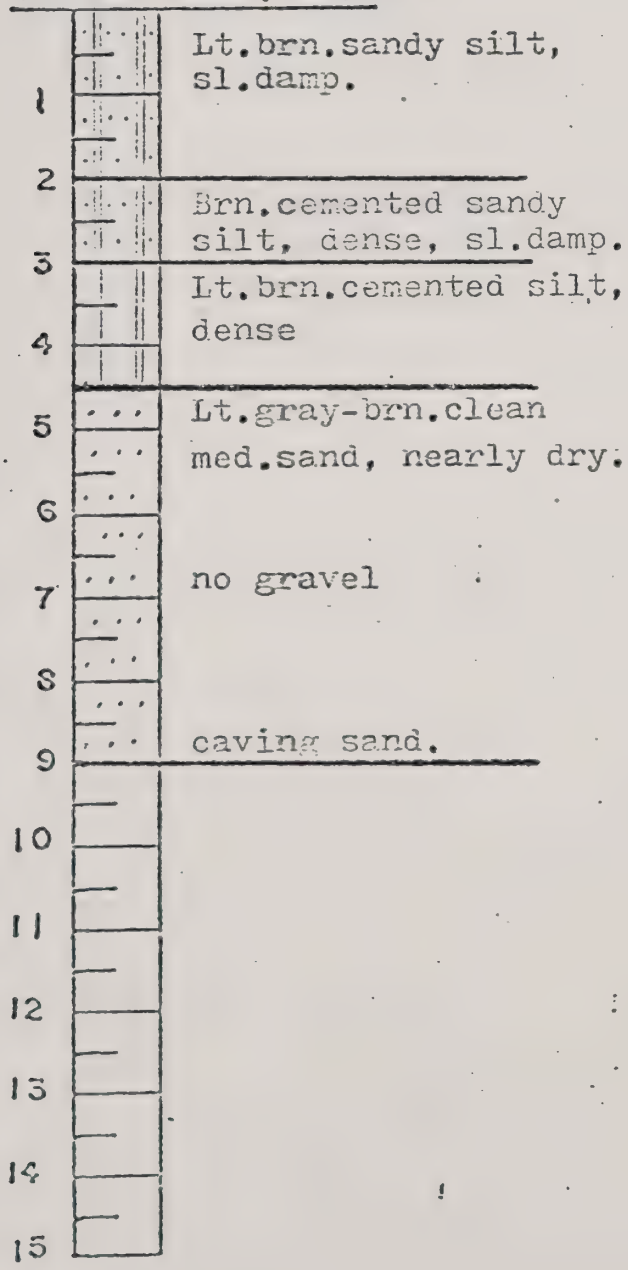
TEST BORING LOG
Hole No. 8

Surface Elev. = 603.4



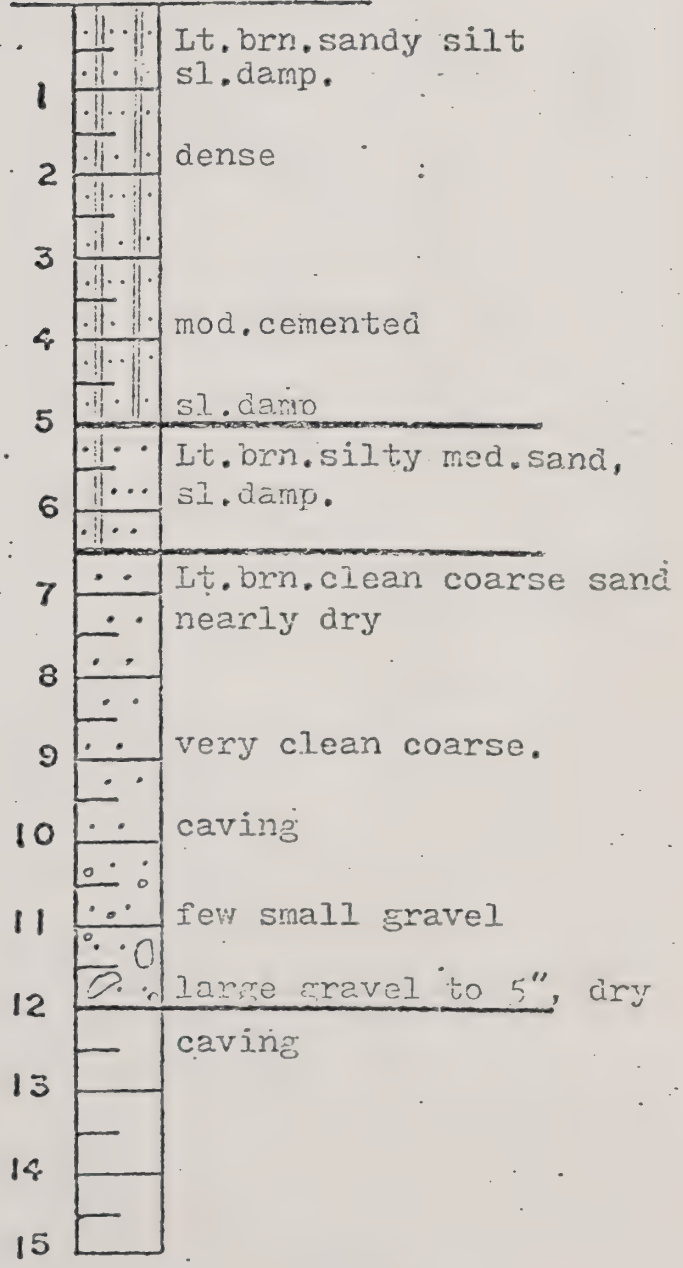
TEST BORING LOG
Hole No. 9

Surface Elev. = 598.1



TEST BORING LOG
Hole No. 10

Surface Elev. = 598.5



TEST BORING LOG
Hole No. 11

Surface Elev. = 602.6



1 Lt.brn.sandy silt very sl.damp.

2

Brn.silt & fine sand cemented, very dense

3

4 sl.damp

5

6

7 increasing sand

8 less cemented

9 some silt balls

10

11 stiff silt layers

12 sl.cemented

13

Lt.brn.nearly clean fine sand, sl.damp.

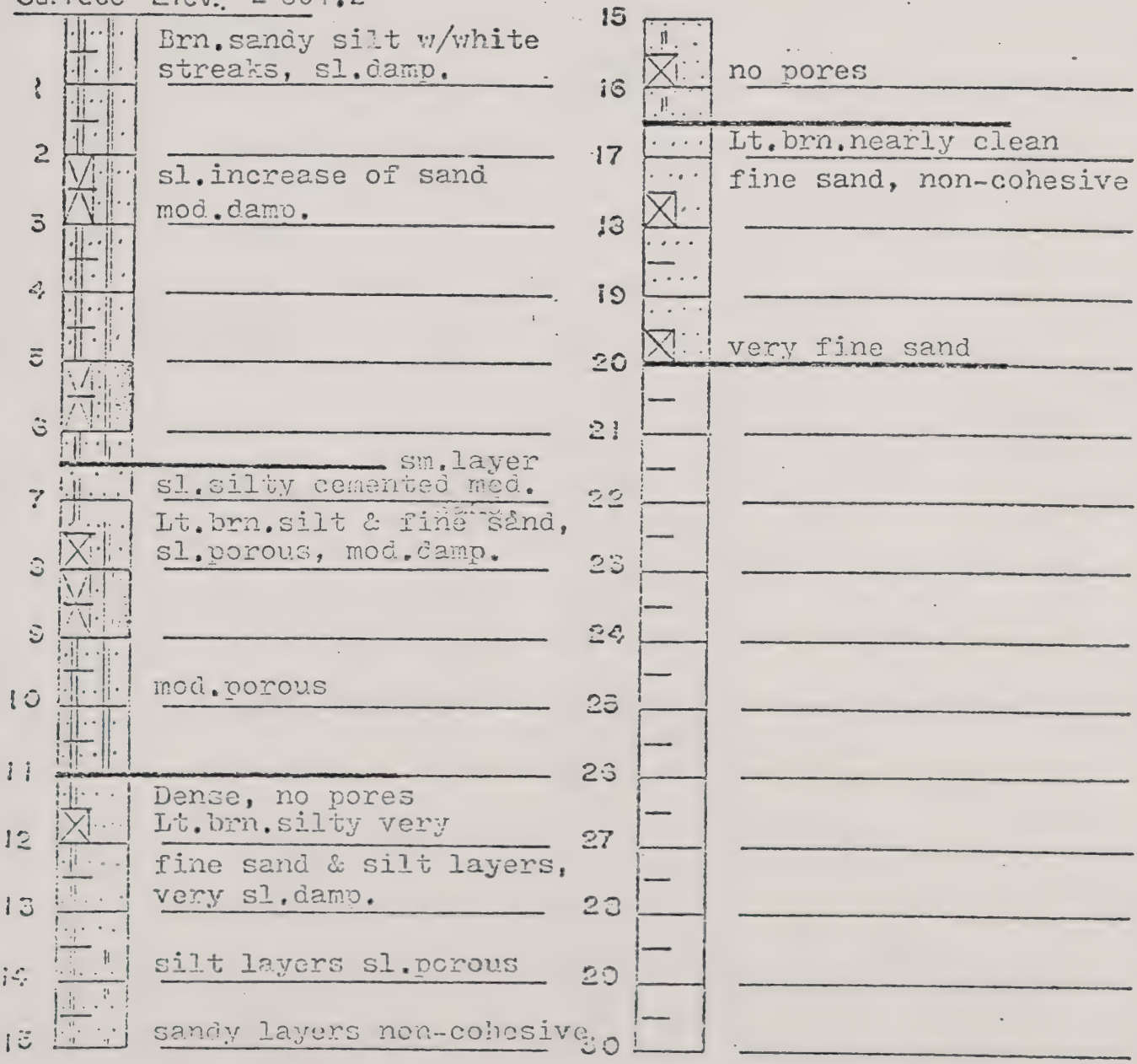
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15 Lt.brn.clean coarse sand, nearly dry.

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TEST BORING LOG
Hole No. 12

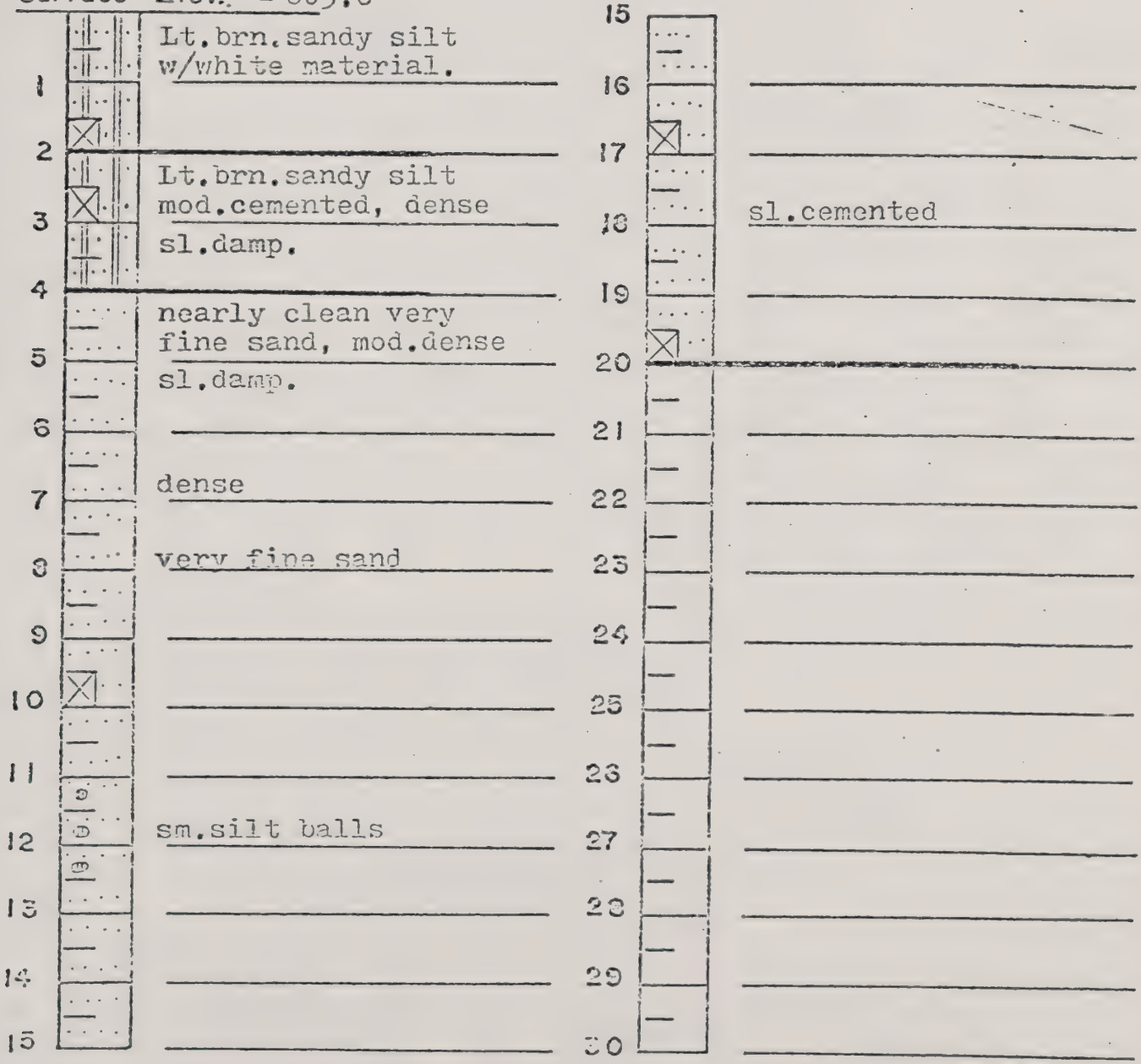
Surface Elev. = 604.2

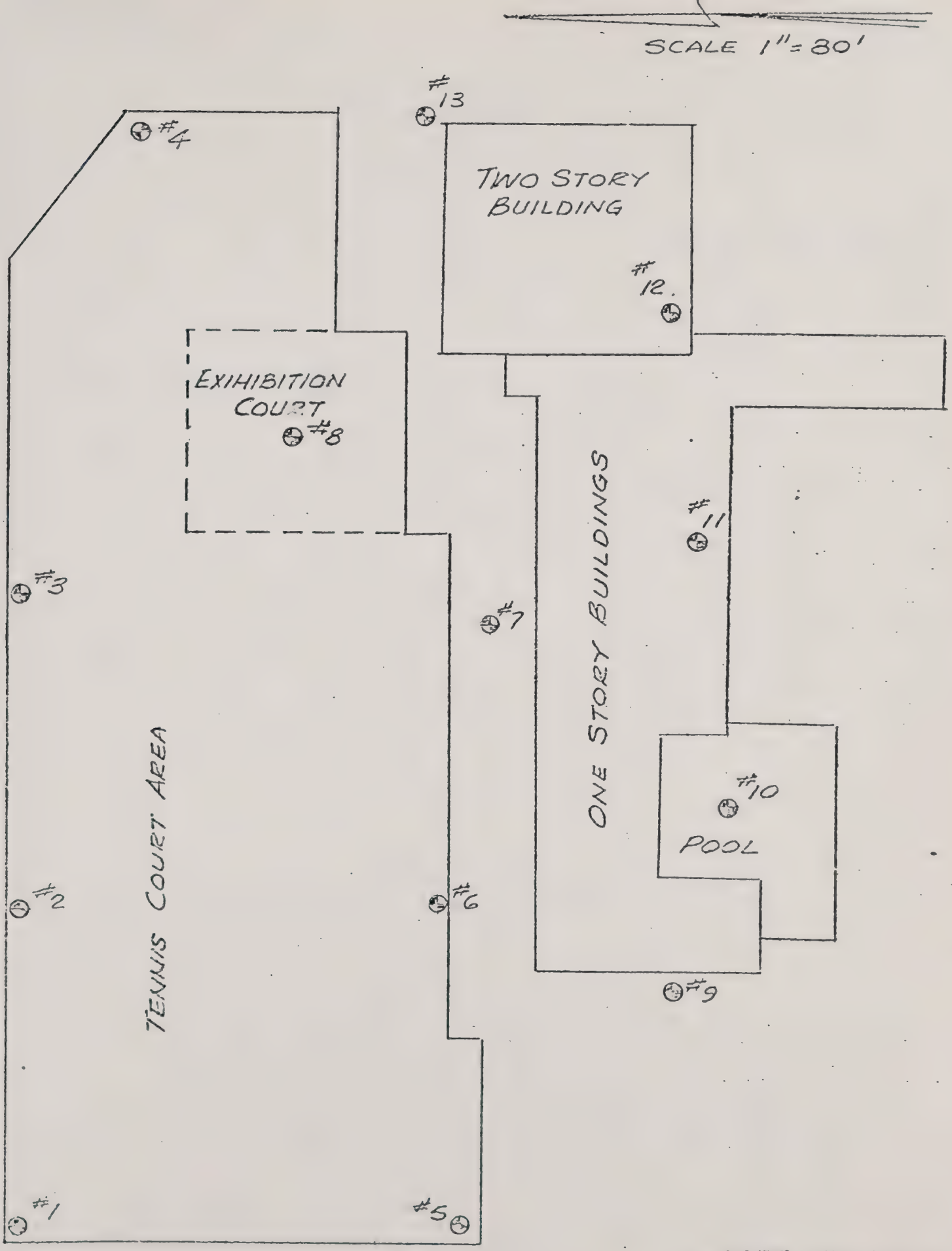


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TEST BORING LOG
Hole No. 13

Surface Elev. = 603.8





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TEST BORING LOCATIONS

CHARLES M. BONNEAU
VICE PRESIDENT

TELEPHONE
AREA CODE 805
327-1486

RICKETT, REAVES & WARD
SOILS ENGINEERING, INC.
2901 H STREET
BAKERSFIELD, CALIFORNIA 93301

File L1824

November 27, 1973

M E M O

IV-D-11(SUPPL.)

To: Jim Delmarter
From: John R. Wilson

Subject: Rio Bravo Tennis Ranch

The Percolation Tests and the log of the hole boring in the same area are listed below.

PERCOLATION TESTS

Hole No.	Depth	Percolation min./1"
1	37.5"	4.4
2	37.0"	5.2
3	38.0"	4.6

HOLE LOG
40' SW of entrance road ℄
& 60' NW of southerly property line (see map attached)

Depth	Description
0'-2½'	Lt. brn. silty med. fine sand, dry.
2½'-3'	Gray white cemented silty sand, gypsum.
3'-9'	Lt. brn. silty med. fine sand, dry, slightly cemented at 4½', with pores, slightly silty med. fine sand at 6'.
9'-12½'	Lt. gray clean med. fine sand, dry. Hard layer at 11'. Slightly cemented at 11½'. Some 1" silt balls at 11½'.
12½'	Bottom of hole. Lt. gray clean med. fine sand, dry slightly cemented, continuing. No types 1 or 2 sand.

CHARLES M. BONNEAU
VICE PRESIDENT

TELEPHONE
AREA CODE 805
327-1486

RICKETT, REAVES & WARD
SOILS ENGINEERING, INC.
2901 H STREET
BAKERSFIELD, CALIFORNIA 93301

File L2031

May 21, 1975

'75 MAY 23 AM 8:23
PLANNING
COMMISSION
KERN CNTY

Rickett, Ward & Delmarter
2901 "H" Street
Bakersfield, Ca. 93301

Attention: Mr. Charles Karoly

Subject: Soil conditions on Rio Bravo Tennis Ranch Development, located on approximately 150 acres in the north half of the south half of Section 4, T.29 S., R.29 E., MDM.

Gentlemen:

In accordance with your instructions I investigated soil conditions on the subject site.

The site is bounded on the north by Kern County Road No.711 except where said road is north of the east-west center-line of said Section 4, said east-west center-line is the boundary, and on the east by Kern County Road No.711A (Both being old Alfred Harrell Hwy.); on the south by present Alfred Harrell Hwy. (new alignment); and on the west by the west line of subject section 4.

The U.S. Department of Agriculture, Soil Conservation Service Report and Map of Kern County, dated September 1967, indicates two soil classifications on the site, bounded as shown on the attached sketch. Pertinent excerpts from said report follow below. --

Soils on the site are all type Cd-Td except approximately 29 acres at the westerly end which are of type $\frac{\text{Df-cs}}{\text{C-2}}$. Approximately 7 acres at the extreme westerly end of the site is not included in the area to be developed for structures.

Cd-TD soils are of the Cajon-Tujunga association. This association consists of somewhat excessively drained coarse textured soils developed from granitic alluvium. Vegetation consists mostly of annual grasses. Mean annual precipitation varies from 6 to 9 inches.

Cajon soils make up about 75 percent and Tujunga soils about 20 percent of the association. Inclusions of Hesperia soils comprise about 5 percent.

Cajon soils have light brownish gray, single grain, sand surface soils and light brownish gray, massive, stratified coarse and medium sand subsoils. Reaction is moderately alkaline and calcareous in the surface and subsoils.

Tujunga soils have grayish brown, single grain, loamy sand surface soils and grayish brown, single grain, stratified loamy coarse sand and loamy sand subsoils. Reaction is neutral in the surface and subsoils. The soils of this association have stratified granitic alluvial material substratums.

Limitations that should be considered when this soil association is used for urban purposes are as follows: Allowable soil pressure limitation is severe. Limitations for untreated steel pipe and shrink swell behavior are low. Limitation for septic tank filter field is slight. Permeability of the soils of this association is rapid, thus contamination of water supplies can result. Spacing of septic tank filter field and well for water supply must be such to avoid contamination.

$\frac{Df\text{-}cs}{C\text{-}2}$ soils are of the Delano-Cuyama association, 5 to 9 percent slopes, eroded.

This association consists of well drained moderately fine textured soils developed on old alluvial fans from mixed rock sources. Vegetation consists mostly of annual grasses. Mean annual precipitation is 8 to 10 inches.

Delano soils make up about 45 percent and Cuyama about 40 percent of the association. Hesperia soils and coarse textured soils comprise about 15 percent.

Delano soils have brown, blocky, loam surface soils and yellowish brown, blocky, sandy clay loam subsoils. Cuyama soils have yellowish brown, massive, loam surface soils and yellowish brown, massive, clay loam subsoils. The soils of this association overlie yellowish brown coarse sand or gravelly sand substrata.

The soils are moderately alkaline in reaction and are calcareous throughout. Erosion rills are common.

In urban use of the association moderate erosion hazards from water exist. Limitations for allowable soil pressure shrink swell behavior, septic tank filter fields, and untreated steel pipe are moderate.

* * * * *

Field observations, sub-surface exploration, and laboratory soil data on hand indicate the above soil descriptions are quite accurate.

Borings, road cuts, and sides of natural drainage channel cuts show underlying gravel layers at shallow depths. Boring logs, soil descriptions, and soil test data are shown on attached sheets. Locations of thirteen borings made in 1972 are shown on a plat of the club house and original tennis court area, said plat follows soil data and first thirteen boring logs. Locations of percolation tests and exploratory boring made in 1973 and exploratory boring made in 1975 are shown on the soil type map of the entire site.

Referring back to statements in the Soil Conservation Report: Limitations for urban use relative to allowable soil bearing pressure; the terms "severe" and "moderate" are subject to interpretation and such limitations also have considerable local variations.

Limitations for large structural loads placed on shallow foundations would be severe but this site is underlain by heavy gravel layers and the total depth of alluvial material overlying marine deposited Round Mountain silt is shallow, averaging 150 feet. Adequate foundations for large structural loads could easily be designed and they would not be subject to the effects of moisture or long-term settlement. Over 90% of expected settlement would occur during construction.

In addition, no high-rise structures or large concentrated foundation loads are planned for this development. Therefore, the description, "severe limitations", becomes much less than "severe" in this case.

It is probable that near-surface soils on individual building locations will require pre-treatment of foundation soils. Pre-treatment methods could include: wetting, compaction in-place, removal and replacement of soils in compacted condition, shallow piers, or other treatment that would stabilize near-surface soils.

It would not be economically feasible to make such determinations until type and precise location of planned structures is known. In the subdivision area it may be practical to make such determinations for groups or tiers of lots.

Site grading will involve cuts and fills. Excavated materials will be satisfactory for construction of compacted fills. Some limitations could be imposed on certain materials for use in constructing fills which will support structures.

Cut and fill slopes may be constructed at a 2 to 1 ratio, 2 units horizontal to one unit vertical. Slope protection against erosion such as grass seeding, ice plant, or landscaping with crushed rock or coarse gravel on slope surfaces will be necessary in most cases.

No active earth-quake faults come up through the alluvial layer in the area. Earth-quakes originating in nearby or far removed faults would not trigger landslides, creep, or earth slippage on this site.

Topography will not require construction of cut or fill slopes greater than critical height.

The only off-site drainage that will reach the site will be conducted across the site in existing drainage channels. On-site drainage will have to be handled in protected channels. Protection can be provided by coarse gravel in low gradient channels, or other means where gradients are steep: Cut and fill slopes must be protected from nearby local run-off running down over cut or fill slope faces.

If initial grading produces fill areas which will later support structures, soil tests should be made on natural soils which will support such fills. Where necessary, such soils should be pre-treated to reduce the possibility of later fill settlement and structural damage. Such settlement, if it occurs, will not produce damage sufficient to endanger life or limb but it may require extensive cosmetic repairs to structures.

General Conclusion - Engineering control of earthwork, proper pre-treatment of soils to support fills and of soils to support foundations, and proper foundation design can reduce the probability of differential settlement sufficient to cause structural damage in this area to practically nil. Allowable safe soil-bearing values of 2,000 lbs. per square foot can be developed.

This is an engineering report of our opinions and conclusions and is not intended as an insurance policy or guarantee against future occurrences from either unforeseen or unnoticed causes.

Respectfully Submitted,

SOILS ENGINEERING, INC.

C.M. Bonneau

C.M. Bonneau
R.C.E. 10664

CMB:jb

TABLE 1

SIEVE ANALYSIS

Boring No.	Depth	% Passing U. S. Standard Sieve Sizes 1½"	3/4"	3/8"	#4	#10	#20	#40	#130	#200
1	9'	91	82	77	64	61	48	30	13	10
1	9' (Passing #4 Fraction)				100	95	75	47	20	16
4	8'				99	91	61	29	6	4
9	8'				99	98	80	44	9	8
12	2' to 3'				100	99	98	96	83	72
13	3'					100	99	98	83	69

TABLE 2

MAXIMUM DENSITY - OPTIMUM MOISTURE
(ASTM D1557-66T, modified to 3 layer)

Location	Depth	Optimum Moisture Content % of dry wt.	Maximum Density lbs./cu.ft.
45' W. of Boring #2	0 to 6"	9.0	125.8
6' SW of Boring #3	1" to 7"	6.8	125.3
12' W of Boring #11	6" to 12"	10.9	122.5
Boring #12	2' to 3'	15.7	112.5
Boring #12	5' to 6'	12.0	111.8
Boring #12	8' to 9'	12.3	104.6

TABLE 3

IN-PLACE NATURAL DENSITY

Location	Depth	Maximum Density lbs./cu.ft. (Table 2)	Natural Moisture Content % of dry wt.	Natural Dry Density lbs./cu.ft.	% of Maximum Density
45' W of Boring #2	0 to 6"	125.8	1.9%	102.1	81%
6' SW of Boring #3	1" to 7"	125.3	1.6%	107.2	86%
12' W of Boring #11	6" to 12"	122.5	2.4%	86.5	71%
Boring #12	5' to 6'	111.8	5.9%	93.7	84%
Boring #12	8' to 9'	104.6	4.5%	85.0	81%

TABLE 4

IN-PLACE MOISTURE CONTENT

Boring No.	Depth	Moisture Content % of dry wt.	Boring No.	Depth	Moisture Content % of dry wt.
1	2'	3.9	9	8'	1.8
1	4'	6.6	11	7'	5.1
1	7'	2.8	12	5'	7.2
1	9'	2.3	12	6'	4.6
1	10'	1.6	12	8'	4.4
2	4'	6.7	12	9'	4.6
3	4'	4.9	12	12'	7.4
3	8'	1.0	12	16'	5.8
4	5'	3.2	12	18'	3.3
4	8'	1.3	12	20'	4.0
5	2'	4.6	13	2'	8.5
5	10'	7.0	13	3'	9.6
7	10'	1.9	13	10'	3.9
8	5'	5.2	13	17'	5.0
8	15'	2.8	13	20'	4.2

TABLE 5

ATTERBURG LIMITS

Boring No.	Depth	Liquid Limit	Plastic Limit	Plasticity Index
12	2' to 3'	30%	16%	14

TABLE 6

DIRECT SHEAR
(Sample remolded to 90% of 112.5 pcf at 15.7% moisture)

Boring No.	Depth	Expansion (at 390 p.s.f.) %/% Moisture Change	Angle (o) of Internal Friction	Cohesion p.s.f.
12	2' to 3'	.041	8°	1060
12	2' to 3'	.041	15°	587

TABLE 7

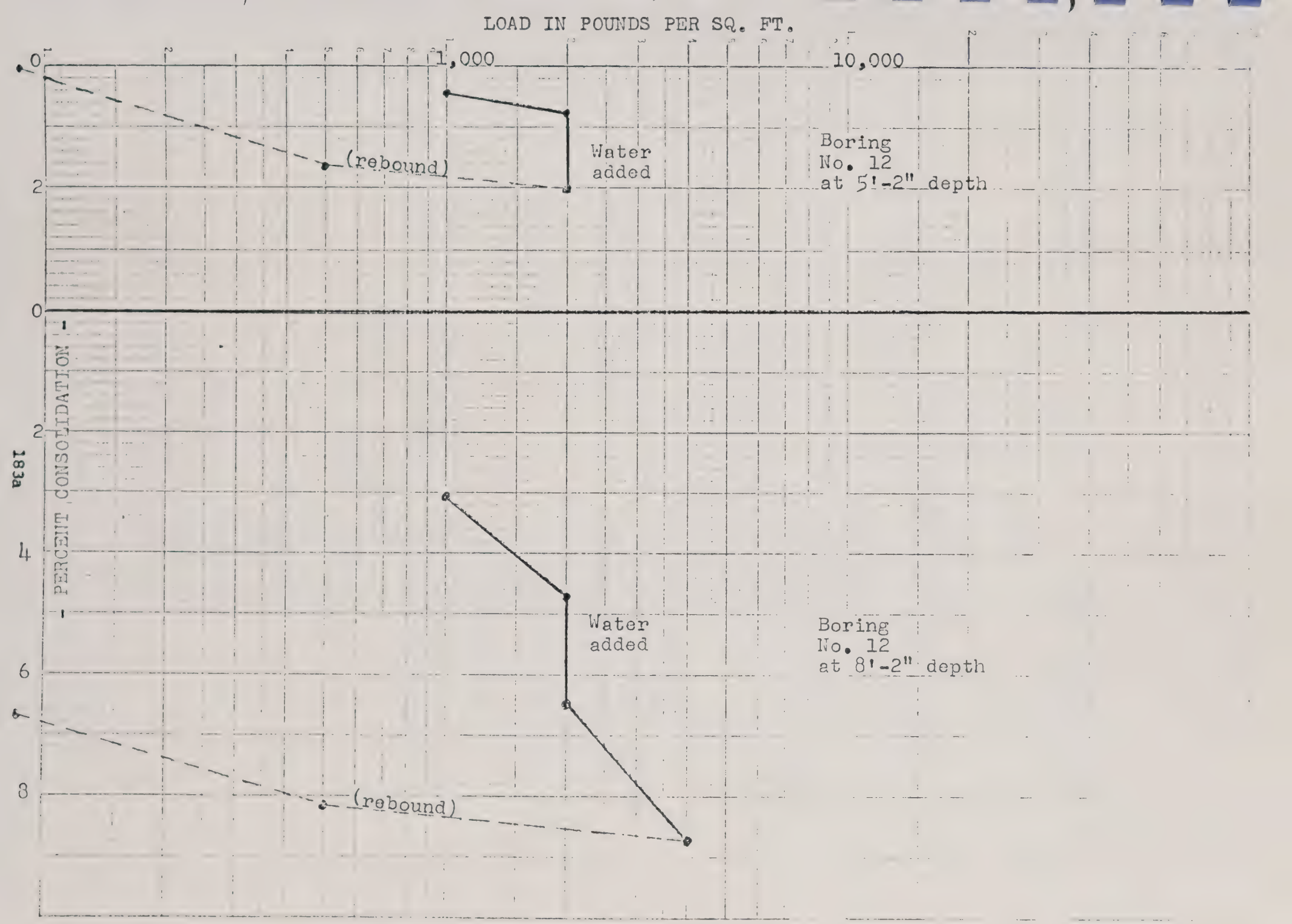
CONSOLIDATION
(Undisturbed Samples)

Boring No.	Depth	1000 psf dry	2000 psf dry	2000 psf wet	4000 psf wet	Rebound	Moisture Content % of dry wt. Before	After
12	5'2"	0.43%	0.73%	2.01%		1.91%	7.2	25.6
12	8'2"	3.07%	4.70%	6.27%	8.73%	2.00%	4.4	27.5

TABLE 8

SOLUBLE SULFATE

Location	Percent Soluble Sulfate
45' W of Boring #2	0.0036%
12' W of Boring #11	0.0038%



183a

- CONSOLIDATION TESTS -

L1636

TEST BORING LOG
Hole No. 1

Surface Elev. = 598.7

1	Lt.red-brn.silty med. fine sand, sl.damp.
2	
3	Brn.silty med.sand, dense, cemented.
4	Darker brn., very dense.
5	less cemented
6	Brn.nearly clean med.& coarse sand. sl.cemented, sl.damp
7	dense
8	Brn.clean sand & river gravel to 2"
9	
10	Lt.gray-brn.clean coarse sand, nearly dry, no gravel or pebbles
11	
12	
13	
14	
15	

TEST BORING LOG
Hole No. 2

Surface Elev. = 601.2

1	Lt.brn.sandy silt very sl.damp.
2	sl.damp.
3	few white streaks dense
4	
5	mod.damp
6	increasing coarser sand damp.
7	Lt.gray-brn.very clean med.& coarse sand, dry.
8	Med.sand w/silt balls
9	Med.fine, very sl.damp
10	sl.coarser, nearly dry.
11	
12	
13	
14	
15	

TEST BORING LOG
Hole No. 3

Surface Elev. = 599.9

1	Lt.brn.sandy silt sl.damp.
2	white streaks, mod.dense.
3	cemented
4	
5	Lt.gray-brn.silt and very fine sand, gritty sl.damp.
6	Mod.dense. sl.cemented
7	Lt.gray brn.clean med.coarse sand nearly dry.
8	
9	very clean, medium sand.
10	
11	
12	
13	
14	
15	

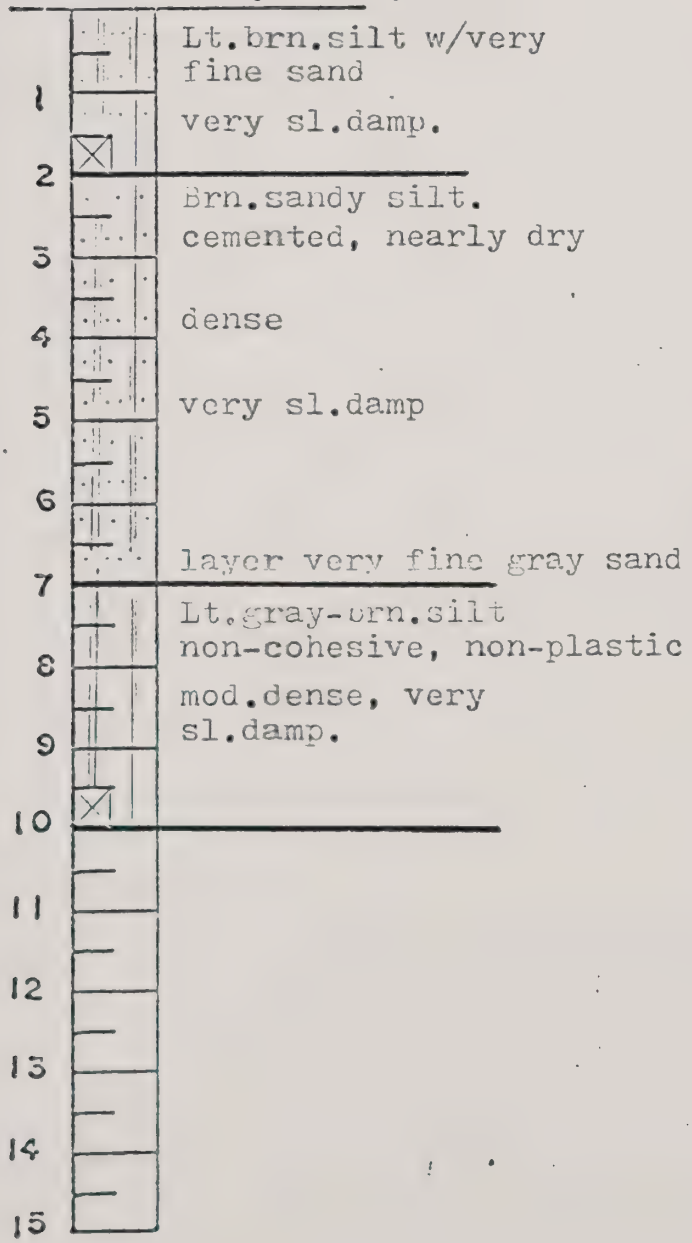
TEST BORING LOG
Hole No. 4

Surface Elev. = 599.0

1	Lt.brn.sandy silt, dry
2	Lt.brn.sand & silt, dry
3	Brn.sandy silt, cemented, dense, white streaks, sl. damp.
4	
5	Lt.brn.silt & fine sand, cemented
6	Lt.brn.& reddish streaks, sl.silty med.sand nearly dry.
7	clearer, coarser.
8	Clean coarse sand reddish-brn.
9	few pebbles
10	coarser, nearly dry.
11	
12	
13	
14	
15	

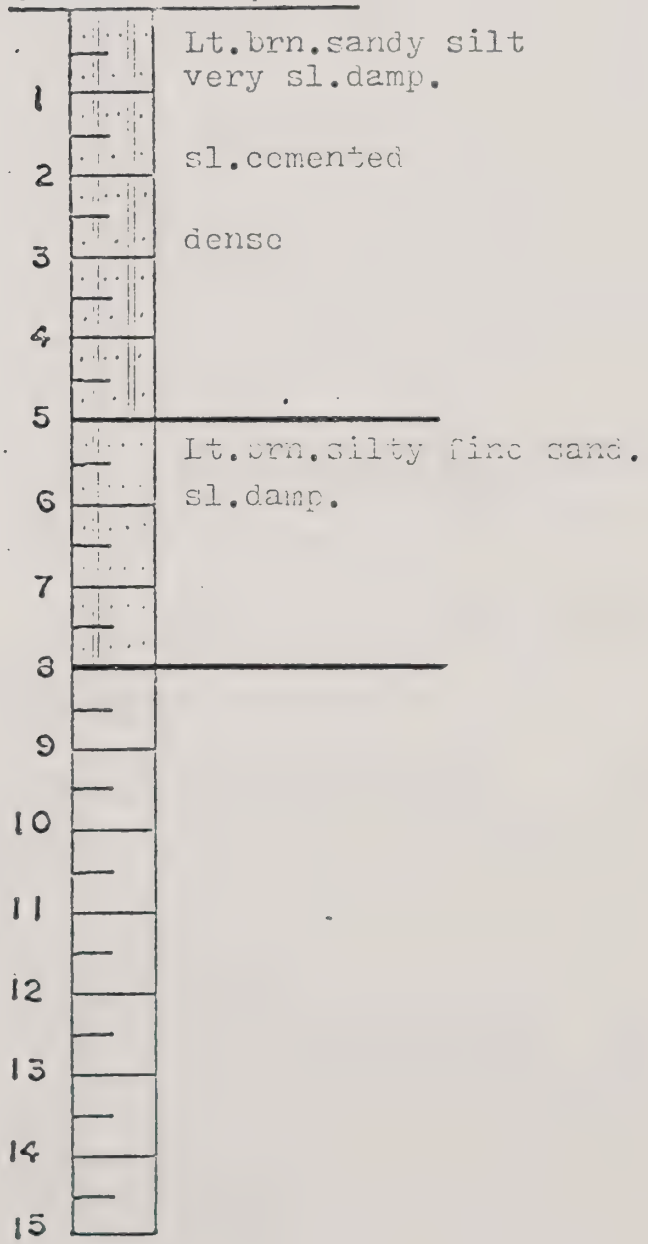
TEST BORING LOG
Hole No. 5

Surface Elev. = 600.0



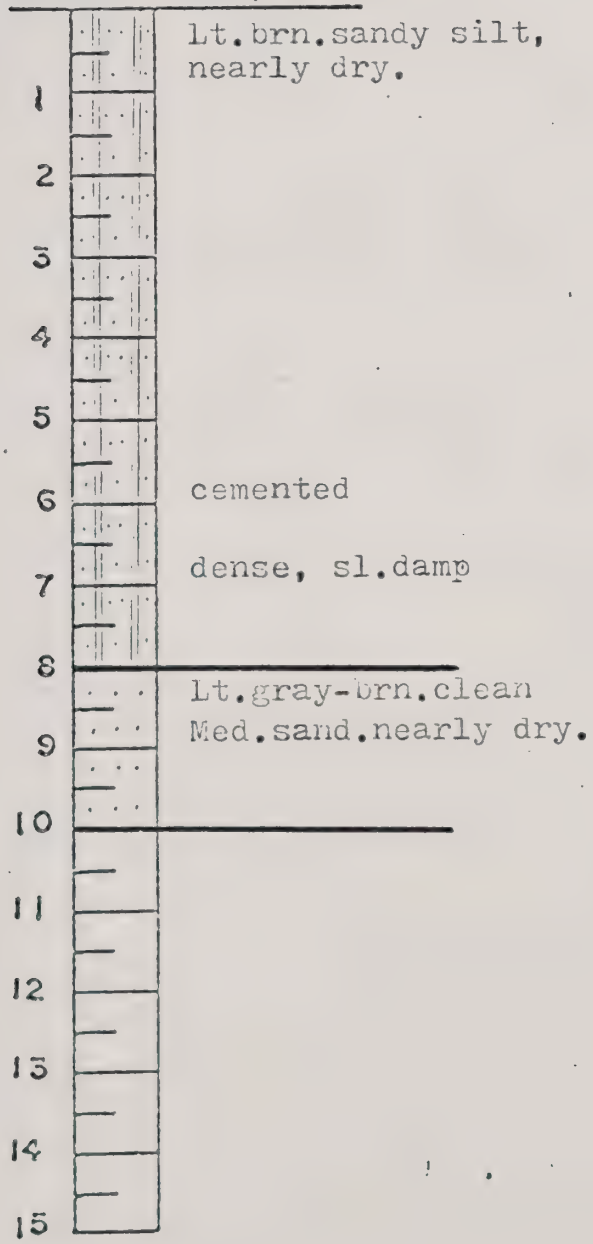
TEST BORING LOG
Hole No. 4

Surface Elev. = 601



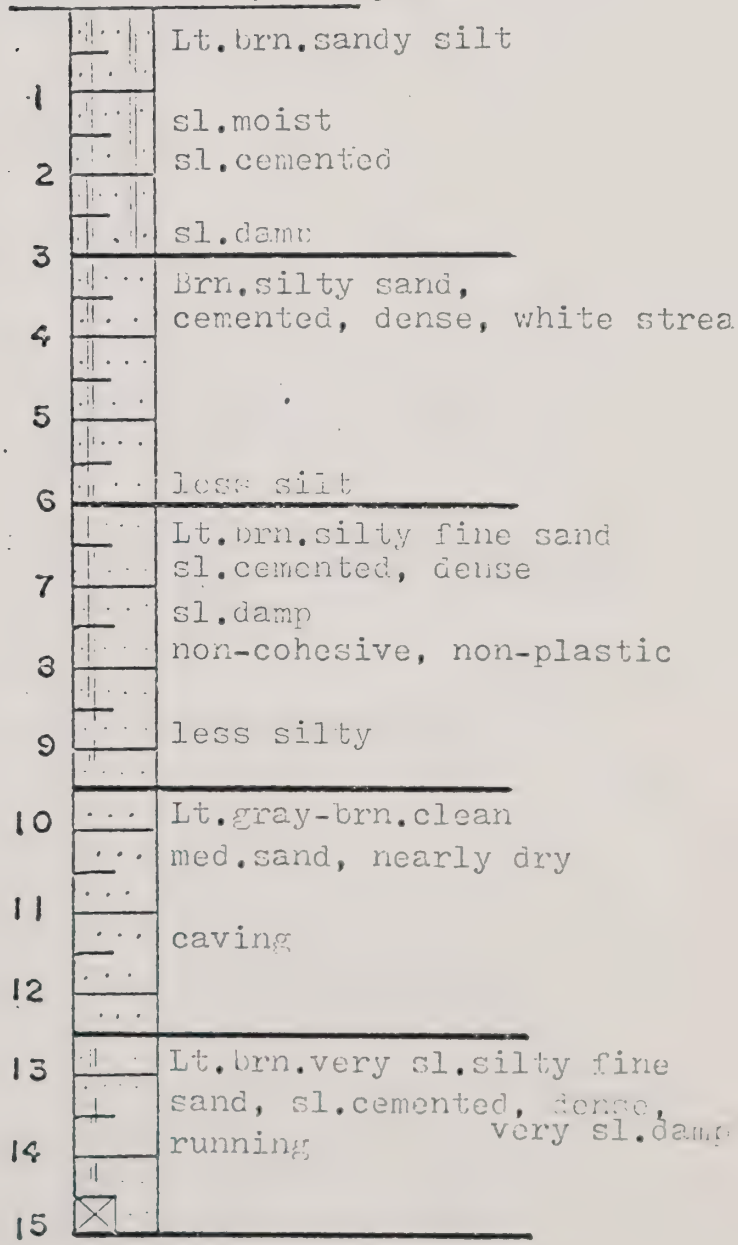
TEST BORING LOG
Hole No. 7

Surface Elev. = 601



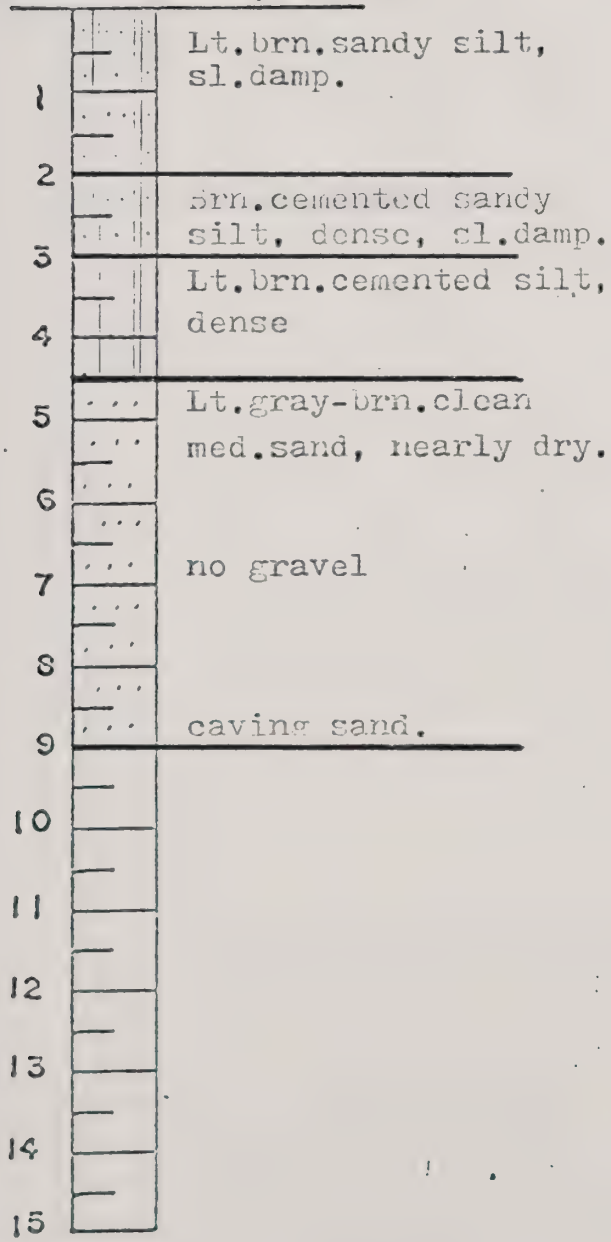
TEST BORING LOG
Hole No. 8

Surface Elev. = 603.4



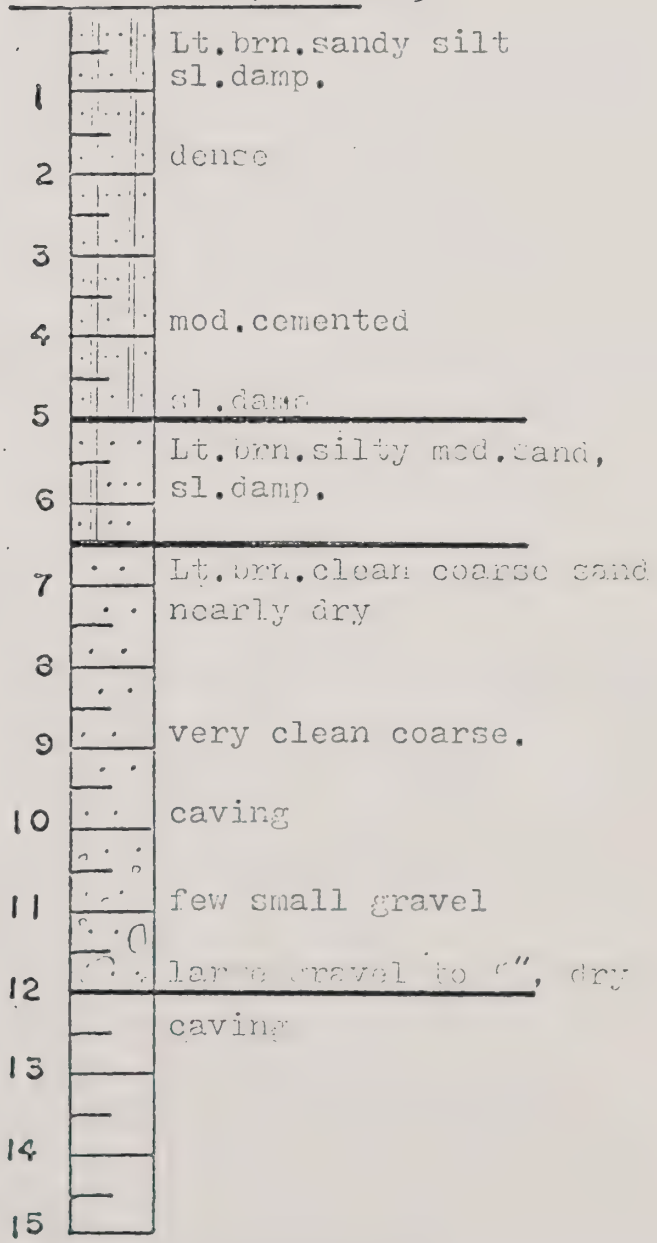
TEST BORING LOG
Hole No. 9

Surface Elev. = 598.1



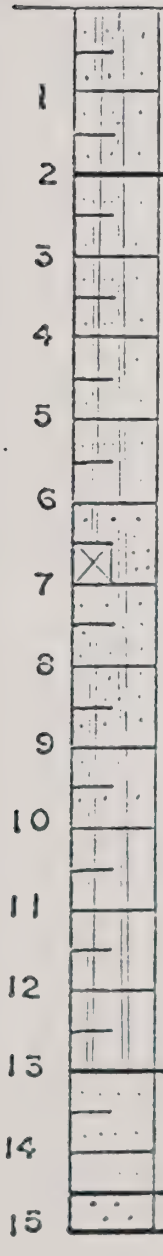
TEST BORING LOG
Hole No. 10

Surface Elev. = 598.5



TEST BORING LOG
Hole No. 11

Surface Elev. = 602.6



1 Lt.brn.sandy silt very sl.damp.

2

2 brn.silt & fine sand cemented, very dense

3

4 sl.damp

5

6

7 increasing sand

8 less cemented

9 some silt balls

10

11 stiff silt layers

12 sl.cemented

13

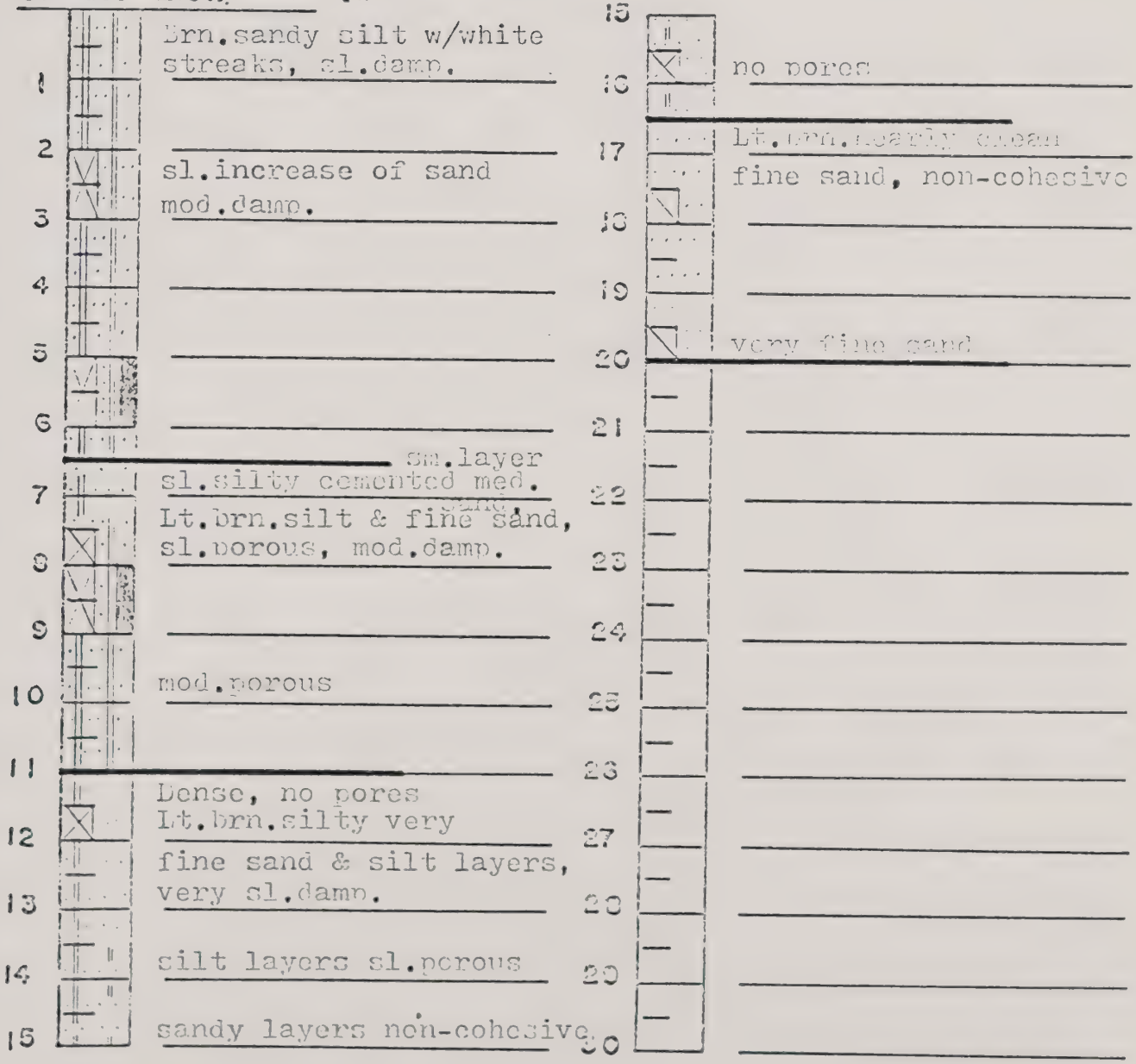
14 Lt.brn.nearly clean fine sand, sl.damp.

15 Lt.brn.clean coarse sand, nearly dry.

RICKETT, REAVES & WARD
SOILS ENGINEERING, INC.

TEST BORING LOG
Hole No. 12

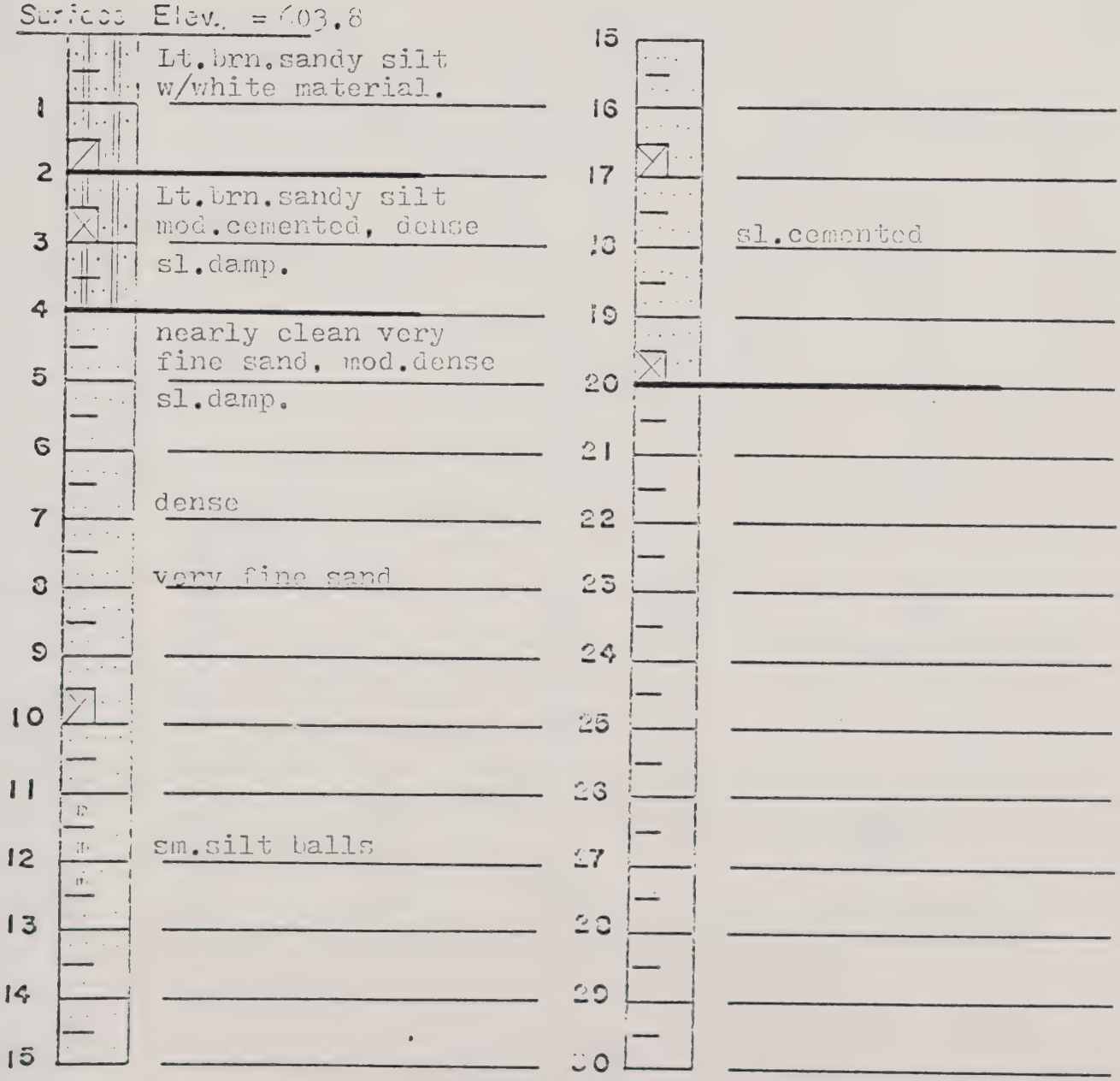
Surface Elev. = 604.2



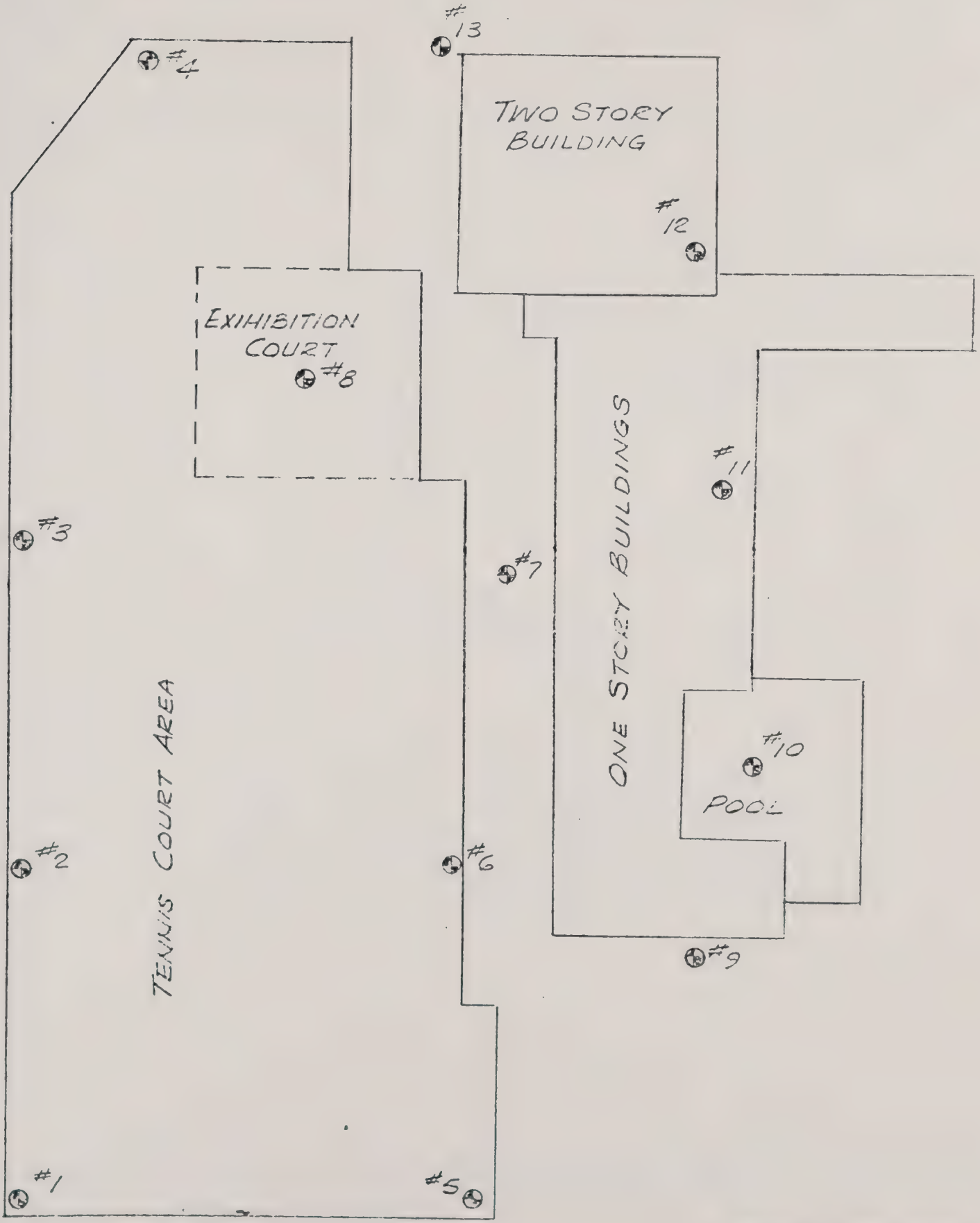
RICKETTS, ALLEN & LAND
SOILS ENGINEERING, INC.

TEST BORING LOG
Hole No. 13

Surface Elev. = 603.8



SCALE 1" = 80'



TEST BORING LOCATIONS

RICKETT, REAVES & WARD
SOILS ENGINEERING, INC.
2901 "H" STREET
BAKERSFIELD, CALIF. - 93301

11-27-73

PERCOLATION TESTS

Hole No.	Depth	Percolation min./1"
1	37.5"	4.4
2	37.0"	5.2
3	38.0"	4.6

HOLE LOG

40' SW of entrance road ℄
& 60' NW of southerly property line (see map attached)

Depth	Description
0'-2½'	Lt. brn. silty med. fine sand, dry.
2½'-3'	Gray white cemented silty sand, gypsum.
3'-9'	Lt. brn. silty med. fine sand, dry, slightly cemented at 4½', with pores, slightly silty med. fine sand at 6'.
9'-12½'	Lt. gray clean med. fine sand, dry. Hard layer at 11'. Slightly cemented at 11½'. Some 1" silt balls at 11½'.
12½'	Bottom of hole. Lt. gray clean med. fine sand, dry slightly cemented, continuing. No types 1 or 2 sand.

lev.

BORING LOG
No. 1

Job No. L1824
Date 12-4-73
Crew JRW

Depth, Ft.	Soil Group	Samples	Moisture, % of dry wt.	Soil Description & Remarks
				74' NE from ℄ entrance road & 53' NW from southerly property line (as per drawing)
	SM	Bag		0'-3': Lt. brn. silty med-fine sand, damp.
	SM			Dry at 1½', moderately permeable Type 3 or 4
5	SM	Bag		3'-3¼': Lt. gray-white caliche gypsum type of material (small layer) Type 4 or 5
		Bag		3¼'-10': Lt. brn. silty med-fine sand, slightly damp.
				Slightly silty at 4½' Type 4 or 5
10	SM			10'-10½': Lt. brn-black silty fine sand. Type 4 or 5
	SM			10½'-11': Lt. brn. very slightly silty med-fine sand,
	ML	Bag		damp, permeable. Type 2 or 3
				11'-15½': Lt. brn. silty, gritty, with some caliche type sand Type 5
15		Bag		Some pores at 14', moderately dense.
	ML SM			15½'-17½': Lt. brn. silty med-fine sand, moderately dense. Type 4 or 5
	ML	Bag		17½'-21': Lt. brn. silt with some fine sand, moderately
20				dense. Type 5
	SP	Bag		21'-23½': Lt. gray-brn. clean med. fine sand, slightly damp, permeable. Type 2
				23½'-28½': Lt. brn. silt with some fine sand, moderately
	ML (SM)	Bag		dense, impervious. Type 5
25		Bag		Some 1/4" hard cemented silt at 24½'
				Trace of gravel at 25'.
		Bag		1-3" gravel with silty fine sand at 25', layer slightly permeable. No gravel at 26'.
	SP (GP) (SM)			Some 3" silty med.sand balls with caliche at 27'. Slightly silty med. sand, very
30		Bag		damp at 28'.
		Bag		28½'-30½': Lt. brn.slightly silty med-coarse sand, Type 1 or 2
	SP GP	Bag		2" gravel at 29½', slightly cemented very coarse sand & angular rock.
				30½'-35': Lt. gray-brn. very slightly silty med.sand some 1" rounded gravel, very permeable Type
35	SP	Bag		Coarser sand at 31½', some ¼" pebbles, slightly running. Layer of clean med-fine sand at 34-34½'.
				35'-40': Lt. gray-brn. clean med.sand Type 1
40				slightly damp & running at 35'
	SW-SM	Bag Bag		Some 3" rounded gravel at 36'. Sand damp & running at 38', occassional 2" rock. 1" rounded gravel at 39'. Sand damp & runnin at
				40'-42': Lt. brn. very slightly silty med.coarse sand at 41', damp & running. Hole sloughing in at 42'. Type 1
45				42': Bottom of hole. Lt. brn.very slightly silty med. coarse sand, very few pebbles, damp & running. Type 1 or 2
				Hole abandoned due to hole sloughing in.

BORING LOG
No. 2

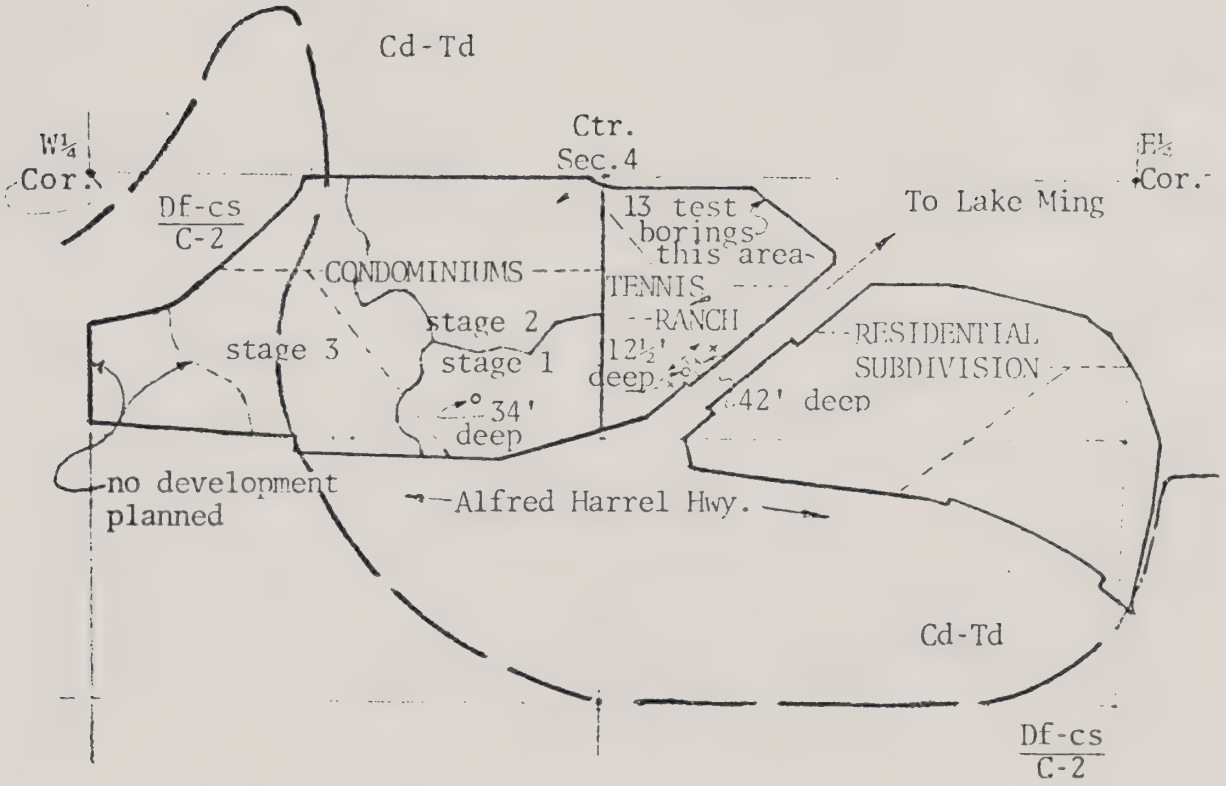
Job No. [illegible]
Date 2-26-75
Crew EJS O&R

300'N+100'W of ℄ pt. in R/W Fence

Elev.	Depth, ft.	Soil group	Samples	Moisture, % of dry wt. (-#200 mesh)	Particle Unit Density, lbs/cu.ft.	Soil Description & Remarks
						Approx. 750'W of intersection of Alfred Harrell Hwy. & Lake Ming Road.
						Lt. brn. silt w/fine sand (dry) Type 5
5						
			Bag			Lt. brn. silty med. to fine sand (dry) Type 4
10						
						Lt. brn. sl. silty fine sand (dry) Type 3
						Lt. brn. silt w/fine sand (damp) Type 5
15						
						Lt. brn. sl. silty fine sand (sl. damp) Type 3
			Bag			
20						
						Lt. gold & brn. clean med. to fine sand (sl. damp) Type 2
			Bag			Lt. grey clean med. sand (dry) Type 1
						Lt. brn. silty coarse sand (damp) Type 4
25						
						Grey clean med. coarse sand (v. sl. damp) Type 1 (dry @ 26½' gravel @ 28½' sand running in @ 29') (water added @ 29')
30						
						Dk. brn. sl. silty coarse sand (well-graded) Type 2
						gravel to 3/4"
						Bottom of hole
35						
						Hole caved in to 29' on last bucket.
40						Attempted to drill to 47 ft., but could not go beyond 34 ft. due to clean dry sand caving into hole.
45						

RIO BRAVO TENNIS RANCH PROPERTY

MAP OF SOIL TYPES, PROPOSED USE AND TEST LOCATIONS



SECTION 4, T.29 S., R.29 E., MDM

LEGEND:

- Property Lines
- Soil Type Boundaries
- Interior Divisions
- Section & Sub-section Lines
- Access
- Borings
- \+ Percolation Tests

Scale: 1"=1,000'

RICKS, TAYLOR & ASSOCIATES INC.
CONSULTING CIVIL ENGINEERS
930 TRUXTUN AVENUE
BAKERSFIELD, CALIFORNIA 93301
PHONE 805-323-3169

	Admin	
	Advance	
	Ag Pres	
✓	Current	
	Zoning	
	Graphics	
	Clerical	
	Assign	
✓	[illegible]	
✓	File	

May 19, 1975

Planning Department
1103 Golden State Highway
Bakersfield, CA 93301

Attention: Alex Esparza

Dear Mr. Esparza:

Attached is a copy of the cover sheet for water facilities constructed by Oicese Water District to provide domestic water to the Rio Bravo Tennis Club area.

Facilities consist of a 1400 gpm treatment plant and pump diversion from the Kern River, a 300,000 gallon steel storage tank and 12 inch ACP pipeline to the tennis ranch. Service to the condominiums will be made by extending a pipeline along the proposed roadway from approximately the entrance of the tennis ranch.

If you have additional questions, please call.

Yours very truly,

Ricks, Taylor & Associates

Gordon Ricks

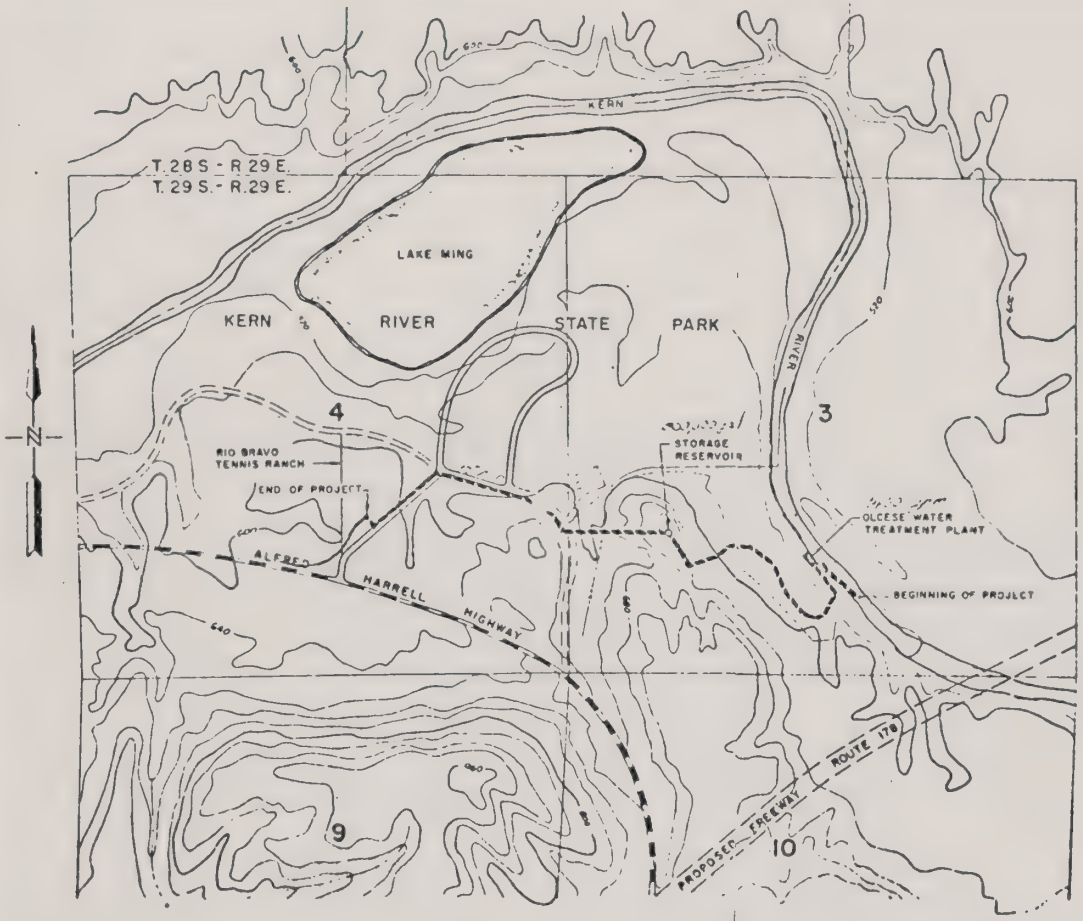
GR:st

cc Ken Ramsey

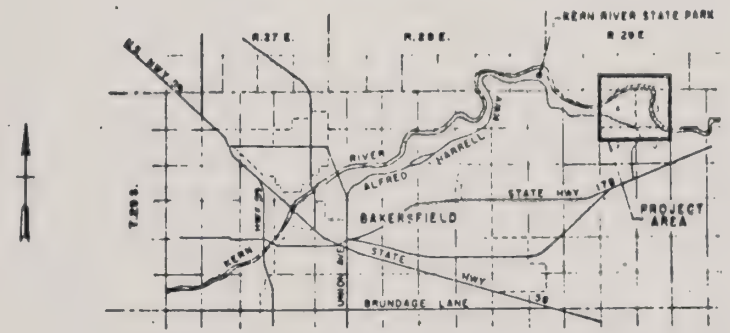
Attachment

KERN COUNTY
1975 MAY 20 AM 10:07
PLANNING COMMISSION

OLCESE WATER DISTRICT
RIO BRAVO PIPELINE SYSTEM
SPECIFICATION NO. 1054-1



PROJECT AREA
SCALE: 1" = 750'



VICINITY MAP
SCALE: 1/2" = 1 MILE

INDEX

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10	MISCELLANEOUS PIPELINE DETAILS

RICKS, TAYLOR & ASSOCIATES, INC.
CONSULTING CIVIL ENGINEERS
BAKERSFIELD, CALIFORNIA

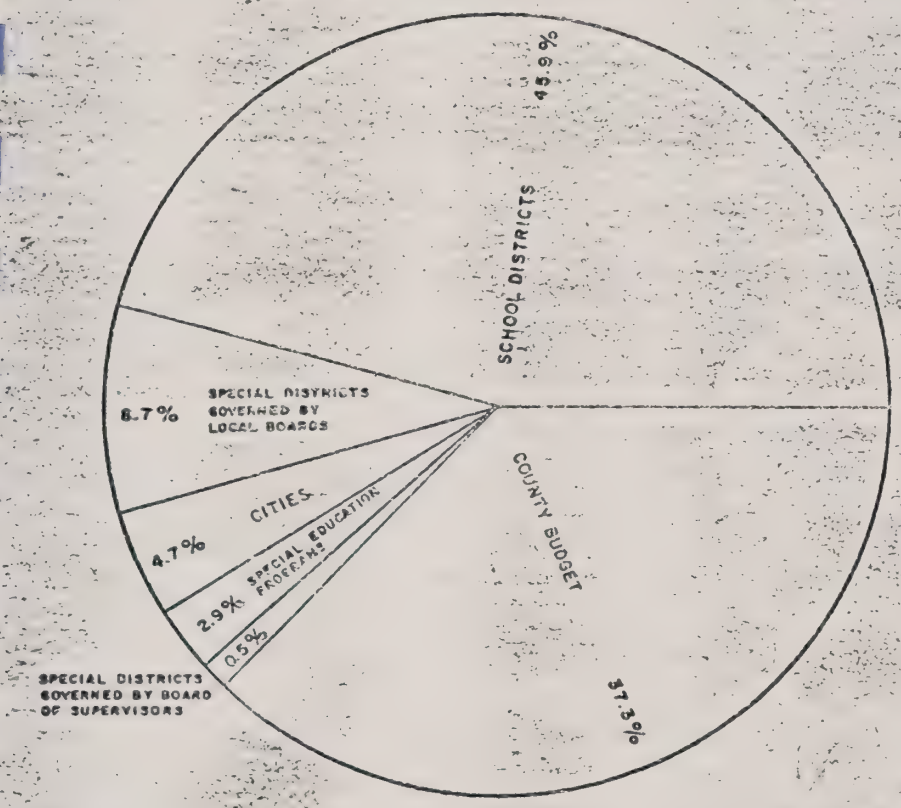
COUNTY OF KERN

1974 – 75

SUMMARY OF BUDGET & TAX DATA

IV-A-8

1974-75 CURRENT PROPERTY TAX BILLINGS

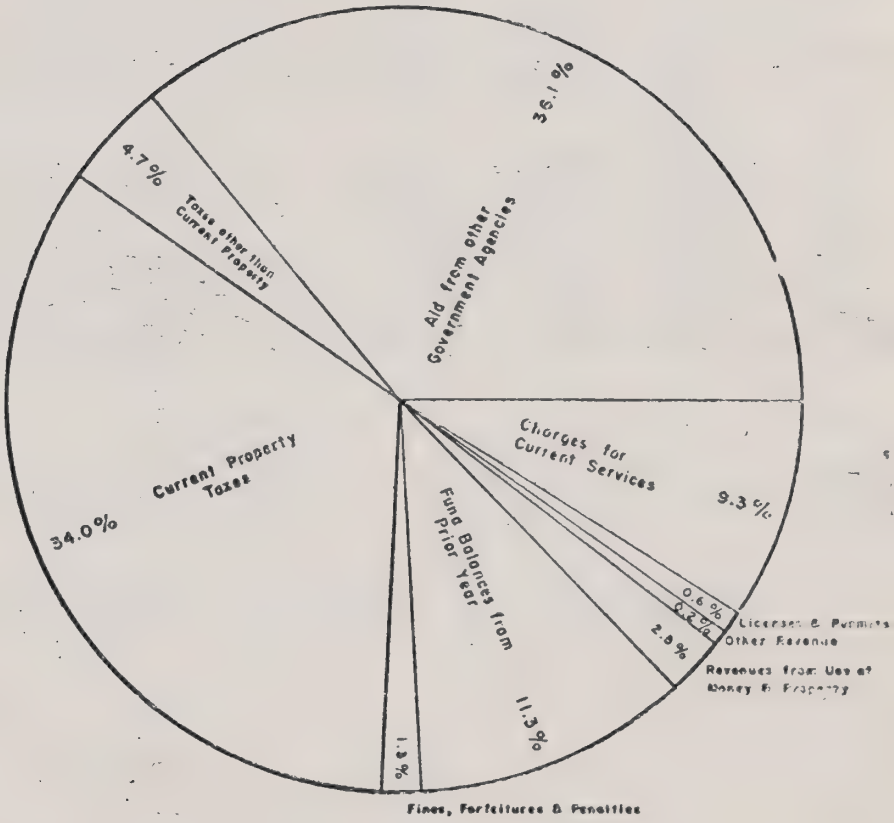


PROPERTY TAX BILLINGS

COUNTY BUDGET	$ 53,731,731
SPECIAL DISTRICTS GOVERNED BY BOARD OF SUPERVISORS	810,658
SPECIAL DISTRICTS GOVERNED BY LOCAL BOARDS	12,565,913
SCHOOL DISTRICTS	66,131,093
SPECIAL EDUCATION PROGRAMS	4,118,803
CITIES	6,776,274
TOTAL BILLINGS	$ 144,134,472

Steve Hoos
Admin. Office

FINANCING OF THE COUNTY BUDGET



SUMMARY OF FINANCING

FUND BALANCES FROM PRIOR YEAR	$	16,962,015
CURRENT PROPERTY TAXES		51,281,499
TAXES OTHER THAN CURRENT PROPERTY		7,139,140
LICENSES & PERMITS		842,890
FINES, FORFEITURES & PENALTIES		1,948,495
REVENUES FROM USE OF MONEY & PROPERTY		3,731,255
AID FROM OTHER GOVERNMENT AGENCIES		54,399,581
CHARGES FOR CURRENT SERVICES		14,046,390
OTHER REVENUES		296,555
TOTAL FINANCING	$	150,647,820

COUNTY OF KERN

BUDGET AND FINANCING DISTRIBUTION

	1973–74	1974–75	Amount of Increase or (Decrease)	Percentage Increase or (Decrease)
BUDGET				
Salaries & Employee Benefits (Net)	$ 59,423,951	$ 70,055,105	$ 10,631,154	17.89
Services & Supplies	24,815,033	29,539,529	4,724,496	19.04
Other Charges (Includes Welfare Direct Financial Aid)	46,309,344	35,733,446	(10,575,898)	(22.84)
Fixed Assets	9,842,624	13,647,372	3,804,748	38.65
Expenditure Reimbursements	(5,631,074)	(7,161,885)	(1,530,811)	(27.19)
Appropriations for Contingencies	1,033,500	1,536,000	502,500	48.63
Total Expenditure Requirements	$135,793,378	$143,349,567	$ 7,556,189	5.56
Reserves	6,081,236	7,258,009	1,176,773	19.35
Total Budget Requirements	$141,874,614	$150,607,576	$ 8,732,962	6.16
FINANCING				
Fund Balances	$ 14,135,710	$ 16,922,015	$ 2,786,305	19.71
Current Property Taxes	40,685,117	51,281,255	10,596,138	26.04
Taxes Other Than Current Property	6,088,544	7,139,140	1,050,596	17.26
Licenses & Permits	643,550	842,890	199,340	30.97
Fines, Forfeitures & Penalties	1,805,260	1,948,495	143,235	7.93
Revenue from Use of Money & Property	2,288,675	3,731,255	1,442,580	63.03
Aid From Other Gov't. Agencies	63,206,008	54,399,581	(8,806,427)	(13.93)
Charges for Current Services	12,790,350	14,046,390	1,256,040	9.82
Other Revenues	231,400	296,555	65,155	28.16
Total Financing	$141,874,614	$150,607,576	$ 8,732,962	6.16

COUNTY BUDGET BY FUNCTION



COUNTY BUDGET

GENERAL GOVERNMENT	$ 24,690,251	16.4
PUBLIC PROTECTION	32,034,544	21.3
PUBLIC WAYS & FACILITIES	11,659,197	7.7
HEALTH & SANITATION	20,495,822	13.6
PUBLIC ASSISTANCE	45,263,818	30.1
EDUCATION	1,974,631	1.3
RECREATION & CULTURE SERVICES	5,195,304	3.4
DEBT SERVICE	500,000	0.3
RESERVES	8,834,253	5.9
TOTAL COUNTY BUDGET	$ 150,647,820	

COUNTY OF KERN

BUDGETS BY GOVERNMENTAL FUNCTION AND DEPARTMENT

	1973–74	1974–75	Amount of Increase or (Decrease)	Percentage Increase or (Decrease)
GENERAL GOVERNMENT				
Board of Supervisors	$ 302,509	$ 349,611	$ 47,102	15.57
Administrative Office	259,211	301,167	41,956	16.19
Clerk of the Board	117,960	127,051	9,091	7.71
Auditor-Controller	442,429	490,194	47,765	10.80
Treasurer	178,451	222,628	44,177	24.76
Assessor	1,525,467	1,825,426	299,959	19.66
Tax & License Collector	276,427	340,464	64,037	23.17
Purchasing Agent	165,386	202,729	37,343	22.58
Purchasing Agent – Stores	12,550	272	(12,278)	(97.83)
Purchasing Agent – Duplicating	——	——	——	——
County Counsel	352,056	484,539	132,483	37.63
Personnel	254,030	271,180	17,150	6.75
Elections – County Clerk	553,839	419,315	(134,524)	(24.29)
Communications	2,672,850	2,908,392	235,542	8.81
General Services	2,032,633	2,119,753	87,120	4.29
Property Management	107,227	122,163	14,936	13.93
Board of Trade	136,344	152,745	16,401	12.03
Data Processing	700,814	837,631	136,817	19.52
Insurance	203,080	932,751	729,671	359.30
Employee Benefits	2,911,729	4,140,220	1,228,491	42.19
General Services – Garage Division	130,981	114,280	(16,701)	(12.75)
Public Works – Surveyor	986,747	1,118,538	131,791	13.36
Capital Projects	5,256,220	7,209,202	1,952,982	37.16
Total General Government	$ 19,578,940	$ 24,690,251	$ 5,111,311	26.11

PUBLIC PROTECTION				
Superior Court	$ 625,003	$ 644,821	$ 19,818	3.17
Bakersfield Municipal Court	625,689	693,080	67,391	10.77
Arvin-Lamont Judicial District	68,769	59,282	6,513	13.35
Buttonwillow Judicial District	17,023	21,675	4,652	27.33
Delano-McFarland Judicial District	48,187	56,277	8,090	16.79
Indian Wells Judicial District	41,451	48,080	6,629	15.99
Kern River Judicial District	30,351	34,997	4,646	15.31
Maricopa-Taft Judicial District	74,637	86,711	12,074	16.18
Mojave Judicial District	44,402	53,809	9,407	21.19
Shafter Judicial District	38,814	43,882	5,068	13.06
Tehachapi Judicial District	39,613	44,353	4,740	11.97
Wasco Judicial District	32,943	42,497	9,554	29.00
Court Expenses – Judicial Districts	35,100	33,600	(1,500)	(4.27)
Grand Jury	66,875	68,375	1,500	2.24
County Clerk	400,104	481,242	81,138	20.28
District Attorney	1,032,249	1,281,747	249,498	24.17
Public Defender	472,130	609,500	137,370	29.10
Sheriff	4,854,114	5,652,426	798,312	16.45
Constables – General Expense	89,698	95,313	5,615	6.26
Jail	956,681	1,102,292	145,611	15.22
Sheriffs Facilities	891,877	1,093,891	202,014	22.65
Juvenile Hall	817,617	961,920	144,303	17.65
Probation	2,175,505	2,474,979	299,474	13.77
Juvenile Forestry Camp	395,128	483,731	88,603	22.42
Kern Youth Facility	306,038	364,879	58,843	19.23
Fire Department	8,951,949	12,056,246	3,104,297	34.69
Drainage & Flood Control	274,500	150,176	(113,324)	(41.11)
Agricultural Commissioner	567,741	645,309	77,568	13.66
Public Works – Building Inspection	573,452	691,769	118,317	20.63
Weights & Measures	185,382	172,767	(12,615)	(6.80)
Board of Supervisors – Special Services	115,500	156,355	40,855	35.37
Recorder	219,463	246,531	27,068	12.33
Coroner, Public Admin., etc.	254,080	344,781	90,701	35.70
Wildlife Resources	13,340	13,450	110	.82
Planning Commission	446,180	607,046	160,866	36.05
Kern Co. Council of Governments	115,107	242,933	127,826	111.05
Dog Pound	78,602	78,870	68	.091
Local Agency Formation Commission	62,157	88,152	25,995	41.82
Range Improvement & Predator Control	7,800	5,000	(2,800)	(35.90)
Total Public Protection	$ 26,025,249	$ 32,031,544	$ 6,009,295	23.09
PUBLIC WAYS AND FACILITIES				
Road Department	$ 9,917,154	$ 10,632,313	$ 715,159	7.21
Airports	818,730	1,026,884	208,154	25.42
Total Public Ways & Facilities	$ 10,735,884	$ 11,659,197	$ 923,313	8.60
HEALTH AND SANITATION				
Health Department	$ 2,814,744	$ 3,449,767	$ 635,023	22.56
Mental Health Services	1,878,836	2,063,518	189,682	10.10
Mental Health – Alcohol	——	250,479	250,479	——
Mental Health – Drug Abuse	——	441,956	441,956	——
Kern General Hospital	10,650,909	11,416,855	765,946	7.19
Medical Services	1,980,597	2,168,148	187,449	9.46
Division of Sanitary Waste Disposal	538,559	700,101	161,542	30.00
Total Health & Sanitation	$ 17,863,745	$ 20,490,822	$ 2,632,077	14.73
PUBLIC ASSISTANCE				
Welfare Administration	$ 9,978,636	$ 11,502,740	$ 1,524,104	15.27
Aid to Aged	8,466,444	——	(8,466,444)	(100.00)
Aid to Blind	602,133	12,000	(590,133)	(98.01)
Aid to Families/Dependent Children	18,368,000	19,458,000	1,090,000	5.93
AFDC – Boarding Homes	1,058,152	1,200,290	142,138	13.43
Aid to Disabled	7,124,832	——	(7,124,832)	(100.00)
AFDC – Unemployed Fathers	1,085,000	1,085,000	——	——
Aid to Indigents	557,200	548,400	(8,800)	(1.58)
Special Programs	644,297	224,900	(419,397)	(65.09)
Other Support and Care	108,040	95,000	(13,040)	(12.07)
Contributions for Medical Care	5,900,000	7,700,000	1,800,000	30.51
Contributions to Other Agencies	——	2,185,196	2,185,196	——
Crippled Children	560,000	571,361	11,361	2.03
Veteran's Service	153,915	179,160	25,245	16.40
Care of Juvenile Court Wards	90,000	124,724	34,724	38.58
Contributions for E.E.A. Program	47,898	6,200	(41,698)	(87.06)
CETA Manpower Agency	——	60,847	60,847	——
SSI/SSP Program	——	310,000	310,000	——
Total Public Assistance	$ 54,744,547	$ 45,263,818	($ 9,480,729)	(17.32)
EDUCATION				
Library	$ 1,631,475	$ 1,843,541	$ 212,066	13.00
Farm and Home Advisor	104,124	116,278	12,154	11.67
Experimental Farm	8,000	14,812	6,812	85.15
Total Education	$ 1,743,599	$ 1,974,631	$ 231,032	13.25

RECREATION & CULTURAL SERVICES				
Parks & Recreation Administration	$ 364,732	$ 505,861	$ 141,129	38.69
Buena Vista Aquatic Recreation Area	1,027,652	2,051,736	1,024,084	99.65
Parks Maintenance Crew	260,804	280,390	19,586	7.51
General Parks	769,968	971,393	201,425	26.16
Local Parks	757,575	832,713	75,138	9.92
Golf Course – Buena Vista	130,233	149,828	19,595	15.05
Golf Course – Kern River	132,576	152,756	20,180	15.22
Golf Course – North Kern	132,868	149,259	16,391	12.34
Museum	91,506	101,368	9,862	10.78
Total Recreation & Cultural Services	$ 3,667,914	$ 5,196,304	$ 1,527,390	41.64
DEBT SERVICE				
Interest and Debt Service	$ 400,000	$ 500,000	$ 100,000	25.00
APPROPRIATIONS FOR CONTINGENCIES	$ 1,033,500	$ 1,536,000	$ 502,500	48.62
Total Expenditure Requirements	$135,793,378	$143,349,567	$ 7,556,189	5.56
PROVISIONS FOR RESERVES	$ 6,081,236	$ 7,258,009	$ 1,176,773	19.35
TOTAL REQUIREMENTS	$141,874,614	$150,607,576	$ 8,732,962	6.16

MISCELLANEOUS COUNTY DATA

	1973–74	1974–75	Amount of Increase or (Decrease)	Percentage Increase or (Decrease)
ASSESSED VALUATION				
Incorporated	$ 313,216,480	$ 327,698,410	$ 14,481,930	4.62
Unincorporated	874,690,220	1,271,396,680	396,706,460	45.35
Total County Assessed Valuation	$1,187,906,700	$1,599,095,090	$411,188,390	34.61
TAX RATES				
County General Tax Rate	3.3800	3.0286	(.3514)	(10.40)
County Fire Tax Rate	.7021	.7217	.0196	2.79
County Advertising Tax Rate	.0061	.0090	.0029	47.54
TOTAL CURRENT PROPERTY TAX BILLINGS				
County Budget	$ 42,784,625	$ 53,731,731	$ 10,947,106	25.8
Special Districts Governed by Board of Supervisors	661,308	810,658	149,349	22.8
Special Districts Governed by Local Boards	10,839,412	12,565,913	1,926,501	18.1
School Districts	54,506,395	66,131,093	11,624,698	21.3
Special Education Programs	2,641,641	4,118,803	1,474,162	55.7
Cities	6,134,179	6,776,274	642,096	10.5
Total	$ 117,370,560	$ 144,134,472	$ 26,783,912	22.8

Prepared by:

Bill J. Jackson
County Auditor-Controller

STATEMENT OF MUNICIPAL OPERATING COSTS[1]
ATTRIBUTABLE FROM RIO BRAVO CONDOMINIUM
AND SUBDIVISION DEVELOPMENT
1977 through 1986

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Elections	$ 200	$ 200	$ 200	$ 200	$ 200	$ 200	$ 200	$ 200	$ 200	$ 200
Assessor's Office	2,658	802	560	-0-	-0-	940	401	280	-0-	-0-
Street Maintenance	773	1,362	1,774	1,774	1,774	1,774	1,774	1,774	1,774	1,774
Library Operation and Maintenance	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057
Sheriff	4,906	7,975	10,120	10,120	10,120	10,120	10,120	10,120	10,120	10,120
Environmental Impact Report and Specific Plan	2,000	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Housing Code Inspections	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Grading Permits	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Mosquito Abatement	-0-	468	468	468	468	468	468	468	468	468
Parks & Recreation	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Fire Protection	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL COSTS	$15,594	$15,864	$18,179	$17,619	$17,619	$18,559	$18,020	$17,899	$17,619	$17,619

[1] All the above costs were determined by the respective County departments or districts except for the Sheriff's Department, which was based on a per capita basis for wages paid that department.

STATEMENT OF MUNICIPAL REVENUES
ACCRUING FROM RIO BRAVO CONDOMINIUM AND
SUBDIVISION DEVELOPMENT - 1977 THROUGH 1986

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Property tax (secured)[1]	$51,151	$ 88,557	$115,386	$115,386	$115,386	$115,386	$115,386	$115,386	$115,386	$115,386
Sales and use tax[2]	11,191	11,191	11,191	11,191	11,191	11,191	11,191	11,191	11,191	11,191
Building permits and inspections[2]	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Grading permits	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Environmental impact reports and specific plan fees[3]	700	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
State motor vehicle violations[2]	4,667	4,667	4,667	4,667	4,667	4,667	4,667	4,667	4,667	4,667
State motor vehicle licenses[2]	6,179	6,179	6,179	6,179	6,179	6,179	6,179	6,179	6,179	6,179
Cigarette tax[2]	1,298	1,298	1,298	1,298	1,298	1,298	1,298	1,298	1,298	1,298
Library fines and fees[2]	106	106	106	106	106	106	106	106	106	106
Highway users' tax[2]	10,872	10,872	10,872	10,872	10,872	10,872	10,872	10,872	10,872	10,872
TOTAL MUNICIPAL REVENUE	$86,164	$122,870	$149,699	$149,699	$149,699	$149,699	$149,699	$149,699	$149,699	$149,699

[1] See table on Appendix Page 207a for calculations of property tax revenue

[2] Based on per capita of the county from the Final Budget 1974-1975

[3] Source: Kern County Planning Department

CALCULATIONS OF PROPERTY TAXES
REVENUE - 1977 THROUGH 1979

A.	Market value of project in 1977	$ 5,228,400
	Assessed value of project in 1977	1,307,100
	Less homeowners' exemption @ $1,750 per dwelling for 122 dwellings	213,500
	Assessed value net of homeowners' exemption	1,093,600
	Plus assessed value of improvements; e.g., landscaping	120,275
	Total net assessed valuation	1,213,875
	Estimated tax revenue generated for school district at a rate of $5.8670/$100 assessed valuation	71,218
	Estimated tax revenue generated for Kern County at a rate of $4.2139/$100 assessed valuation	51,151
	TOTAL PROPERTY TAX REVENUE, 1977	$ 122,369
B.	Market value of project in 1978	$ 9,214,194
	Assessed value of project in 1978	2,303,549
	Less homeowners' exemption @ $1,750 per dwelling for 215 dwellings	376,250
	Assessed value net of homeowners' exemption	1,927,299
	Plus assessed value of improvements	174,250
	Total net assessed valuation	2,101,549
	Estimated tax revenue generated for school district at a rate of $5.8670/$100 assessed valuation	123,298
	Estimated tax revenue generated for Kern County at a rate of $4.2139/$100 assessed valuation	88,557
	TOTAL PROPERTY TAX REVENUE, 1978	$ 211,855
C.	Market value of project in 1979	$11,999,964
	Assessed value of project in 1979	2,999,991
	Less homeowners' exemption @ $1,750 per dwelling for 280 dwellings	490,000
	Assessed value net of homeowners' exemption	2,509,991
	Plus assessed value of improvements	228,225
	Total net assessed valuation	2,738,216
	Estimated tax revenue generated for school district at a rate of $5.8670/$100 assessed valuation	160,651
	Estimated tax revenue generated for Kern County at a rate of $4.2139/$100 assessed valuation	115,386
	TOTAL PROPERTY TAX REVENUE, 1979	$ 276,037

ESTIMATED HOURS OF LABOR INCURRED BY PROPOSED PROJECT

A. Condominiums - 200 dwelling units

Category	Estimated Hours of Labor
Building grading	7,000
Building concrete work	21,000
Building masonry work	21,000
Building carpentry	79,000
Building cabinetry/millwork	57,000
Building heating, air conditioning and plumbing	57,000
Building electrical	21,000
Building painting	21,000
Building plastering	29,000
Building roofing	21,000
Building floor coverings	7,000
Building sitework	15,000
Building administration	44,000
Subtotal - Building - 200 units	400,000 hours

B. Condominium Site Improvement

Category	Estimated Hours of Labor
General site grading	4,000
Street construction	5,000
Site water system	4,000
Site drainage	1,000
Site utilities	2,000
Site landscaping	3,000
Site administration	1,000
Subtotal - Site Improvements	20,000 hours
TOTAL	= 420,000 hours
	= 2,100 hours/unit

Estimated Hours of Labor Incurred
by Proposed Project (continued)

C. Subdivision - 80 dwelling units

Category	Estimated Hours of Labor
Building grading	3,000
Building concrete work	9,000
Building masonry	9,000
Building carpentry	31,000
Building cabinetry/millwork	23,000
Building heating, air conditioning and plumbing	23,000
Building electrical	9,000
Building painting	9,000
Building plastering	11,000
Building roofing	9,000
Building floor coverings	3,000
Building sitework	5,000
Building administration	16,000
Subtotal - Building - 80 units	160,000 hours

D. Subdivision Site Improvement

Category	Estimated Hours of Labor
General tract grading	1,000
Street construction	4,000
Tract water system	2,000
Tract drainage	1,000
Tract utilities	1,500
Tract administration	500
Subtotal - Tract Work	10,000 hours
TOTAL	= 170,000 hours
	= 2,100 hours/unit

E. Full-time Work Force Upon Completion of Project

Security	8 employees
Maintenance	10 employees
Total	18 employees

18 at $10,000/yr. = $180,000

ADDITIONAL REGIONAL INCOME FROM CONSTRUCTION OF
CONDOMINIUM AND SUBDIVISION PROJECT

Year	Construction Payroll			Local Material Purchase		Total
	Construction force in work hours	Annual Payroll	Additional[1] Regional Income	Cost	Additional Regional Income	Additional Regional Income
1977	342,200 hours	$2,419,596	$2,903,515	$1,008,678	$1,210,414	$4,113,929
1978	381,300	2,696,061	3,235,273	768,911	922,693	4,157,966
1979	266,500	1,884,343	2,261,212	537,411	644,893	2,906,105
Total	990,000 hours	$7,000,000	$8,400,000	$2,315,000	$2,778,000	$11,178,000

[1] Assumed a regional multiplier factor of 1.2

ADDITIONAL RETAIL SALES AND SALES TAX REVENUES
RESULTING FROM CONSTRUCTION ACTIVITIES FOR
PROPOSED CONDOMINIUM AND SUBDIVISION DEVELOPMENT

Year	Additional Regional Income	Estimated Additional Retail Sales in Kern County[1]	Estimated Additional Kern County Sales Tax Revenues
1977	$4,113,929	$1,645,572	$20,570
1978	4,157,966	1,663,186	20,790
1979	2,906,105	1,162,442	14,530
Total	$11,178,000	$4,471,200	$55,890

[1] Assumption of 40 percent personal income spent on retail sales based on 1972 figures for retail sales and personal income. Source: Statistical and Economic Profile Kern County, 1975 Edition

ESTIMATED MATERIAL REQUIREMENT COSTS

The estimated material requirements for the project, valued in dollars, are:

Building Work	
Sand and gravel	$1,100,000
Portland cement	120,000
Wood	2,000,000
Metal products	1,200,000
Paint	120,000
Floor coverings	360,000
Appliances	240,000
Miscellaneous	120,000
	$5,260,000
Condominium Site and Tract Improvements	
Sand and gravel	$ 79,000
Portland cement	5,000
Asphalt	16,000
Water pipe and fittings	74,000
Drainage culverts	
Utilities materials	40,000
Landscape materials	33,000
	$ 260,000
Total	$5,520,000

The estimated additional regional income from construction of the project is as follows:

a. Construction forces		$7,000,000
b. Local materials		
1. Sand and gravel	$1,179,000	
2. Lumber products	1,000,000	
3. Paint	120,000	
4. Asphalt	16,000	
		2,315,000
Total income from construction		$9,315,000

MAXIMUM EXPECTED RUNOFF - RIO BRAVO SPECIFIC PLAN

(190-acre condominium and tennis ranch catchment)

Assume: Soil is at or near field capacity before 24-hour storm

Given: Mean February potential evapotranspiration (PE) = 4.57 cm*

Maximum recorded February 24-hour precipitation = 3.02 cm⊕ (1962)

Area of catchment = 190 acres‡ x 4047 = 768,930 square meters

Runoff calculation:

Precipitation (-) PE = Runoff

$$3.02 \text{ cm } (-) \frac{4.57 \text{ cm/month}}{28 \text{ days/month}} = 2.86 \text{ cm/day runoff}$$

$$= .0286 \text{ meters/day runoff}$$

Volume of runoff:

V = (runoff) (area of catchment)

V = (.2086 meters/day) (768,930 square meters)

V = about 22,000 cubic meters/day
using 1 acre-foot = 1,233 cubic meters

V = about 17.8 acre-feet/day, or about 21% of volume of Lake Ming‡

Note: The calculation of volume of runoff performed considers catchment is in its natural state. Structures, streets, and other nonpervious surfaces were not considered. However, as structures etc. are built, soil will not have to be as close to field capacity as assumed here to allow the calculated amount of runoff.

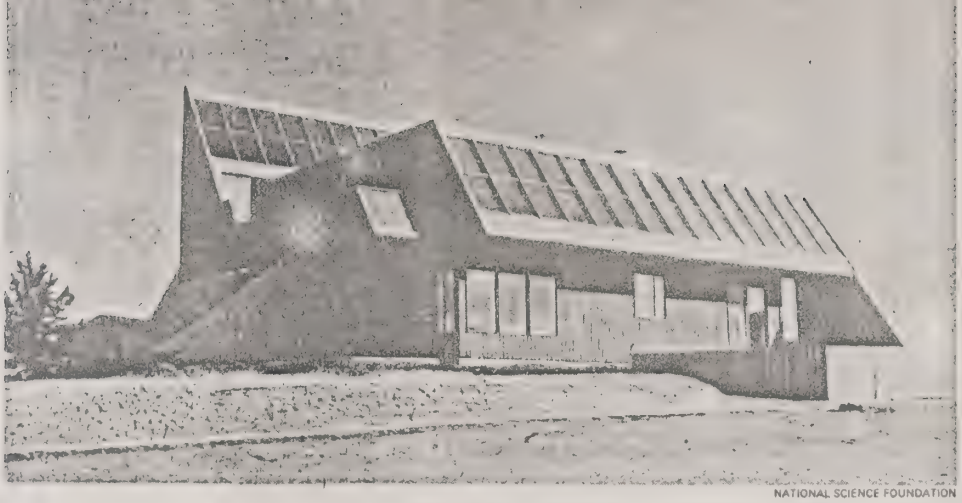
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* Source: California Department of Water Resources (1960 to 1965 observation period)

⊕ Source: National Oceanic and Atmospheric Administration, Local Climatological Data, 1974, Bakersfield, California

‡ Source: Environmental data submitted by applicant's representative

‡ Volume of Lake Ming is normally kept at 84 acre-feet (Source: Kern County Public Works Department)



NATIONAL SCIENCE FOUNDATION

Solar home, prototype for one city's "Phoenix Project."

COLORADO SHOWS HOW TO PUT SUN TO WORK

COLORADO SPRINGS, Colo.

This Rocky Mountain State, with its pioneering tradition, is leading the nation into the age of solar energy.

Hard hit by diminishing supplies of natural gas for home and commercial heating, innovative builders in town after town are turning to the sun as an alternate fuel source.

From Denver to Fort Collins, to the ski-resort town of Snowmass, solar homes and office buildings are going up across the State.

"Solar fever." In no other city, however, has "solar fever" reached the level that prevails in Colorado Springs.

Local bankers, builders, educators and even the town council are exploring the possibilities of the sun's potential.

It all began in the summer of 1973. Colorado Springs—one of America's fastest-growing cities—was forced to impose a moratorium on new natural-gas hookups because its supplier was unable to guarantee new commitments. Fuel oil for home heating was already in short supply and electricity rates were on the rise.

By December of 1973, Mayor Andrew Marshall had organized a citizen's group to look into the problem. From their deliberations, the "Phoenix Project" was born—construction of an experimental solar house that would be the basis for research and development of this energy source.

The city formed a nonprofit corporation to oversee construction of the house.

Local banks and the Homebuilders Association of Colorado Springs financed the $95,000 in building costs. The National Science Foundation added another $46,000 to pay for the monitoring and analysis of the system's day-to-day performance.

Experiment a success. In its first winter, the Phoenix house proved even to the skeptics that heat from the sun could do the job. Solar energy provided the home with 85 per cent of its heating needs. The rest came from a back-up furnace fueled by natural gas.

Today, across the street from the experimental house, there is another solar home. This one was designed and paid for by the owner himself.

On the outskirts of the city, a 30-million-dollar hospital complex is being built and it will have a 1-million-dollar solar heating system. The initial capital outlay is steep, admits one city official, but the system should pay for itself in six years through saving on fuel bills.

At the Air Force Academy, near the city, a single-family home will be converted this summer to a solar heating system designed by faculty and engineering students. And next autumn, the Academy will offer two new courses, both aimed at increasing expertise and interest in the field.

Douglas Jardine, a contractor in Colorado Springs who has been bitten by the "solar bug," was a leader in the Phoenix Project. He feels that the city has only just begun to innovate.

Next in line, says Mr. Jardine, will be a neighborhood solar-energy heating system. His plan is to heat 54 low-income homes from a single central bank of solar collectors. For this ambitious project, Colorado Springs is requesting financial assistance from the Federal Government. If the money is granted, work will begin next year.

Solar-heat companies. By 1980, 20 per cent of the buildings in Colorado Springs could be heated by the sun, says Mayor Marshall. And the city-owned utility in this instance will lead the way.

Mr. Marshall sees utilities throughout the U.S. getting into the solar-heat field because: "Many people won't be able to afford to pay as much as $6,000 for a solar heating system. Utilities have the money to make that investment and they could in turn lease the unit to the consumer."

Elsewhere across Colorado, small solar-energy companies are springing up to meet growing demand.

In Nederland, located in the mountains just west of Boulder, is International Solarthermics Corporation. This small research-oriented firm is now granting licenses for the right to manufacture its back-yard solar-heat furnace. Within a year, the company claims, a solar generator will be ready for marketing. It would provide not only heat, but also electricity.

And in Denver, Solaron Corporation just put the finishing touches on a $60,000 solar heating system for the corporate-headquarters building of the Gump Glass Company. John Bayless, President of Solaron, reports his company also has developed a collector and storage system for the home that is ready for installation anywhere in the United States.

Other enterprising architects and builders, innovative home-owners and corporate planners in Colorado are turning to the sun to save on skyrocketing energy costs.

The Denver Community College plans to build a 12-million-dollar solar-heated classroom complex. In Boulder, at least two homes are heated by the sun and eight new solar townhouse units are under construction. Three solar homes are going up in Fort Collins. And in Snowmass, a dentist built his own home system in order to cut down on heating bills.

In addition to actual construction, there is also a boom in solar-energy education. Most of the big universities in Colorado are adding courses—some are aimed at engineers and architects, others are designed to train the technicians who must install and repair the systems.

International Solarthermics has established its own College of Solar Technology. Solaron Corporation plans to train some 2,000 technicians per year to handle its maintenance and installation work. And in Colorado Springs, officials say 120 students will get on-the-job training during construction of the new hospital.

Despite all this Statewide activity, Mayor Marshall says he aims to keep the lead his city holds and make it the "solar-energy capital of the world."

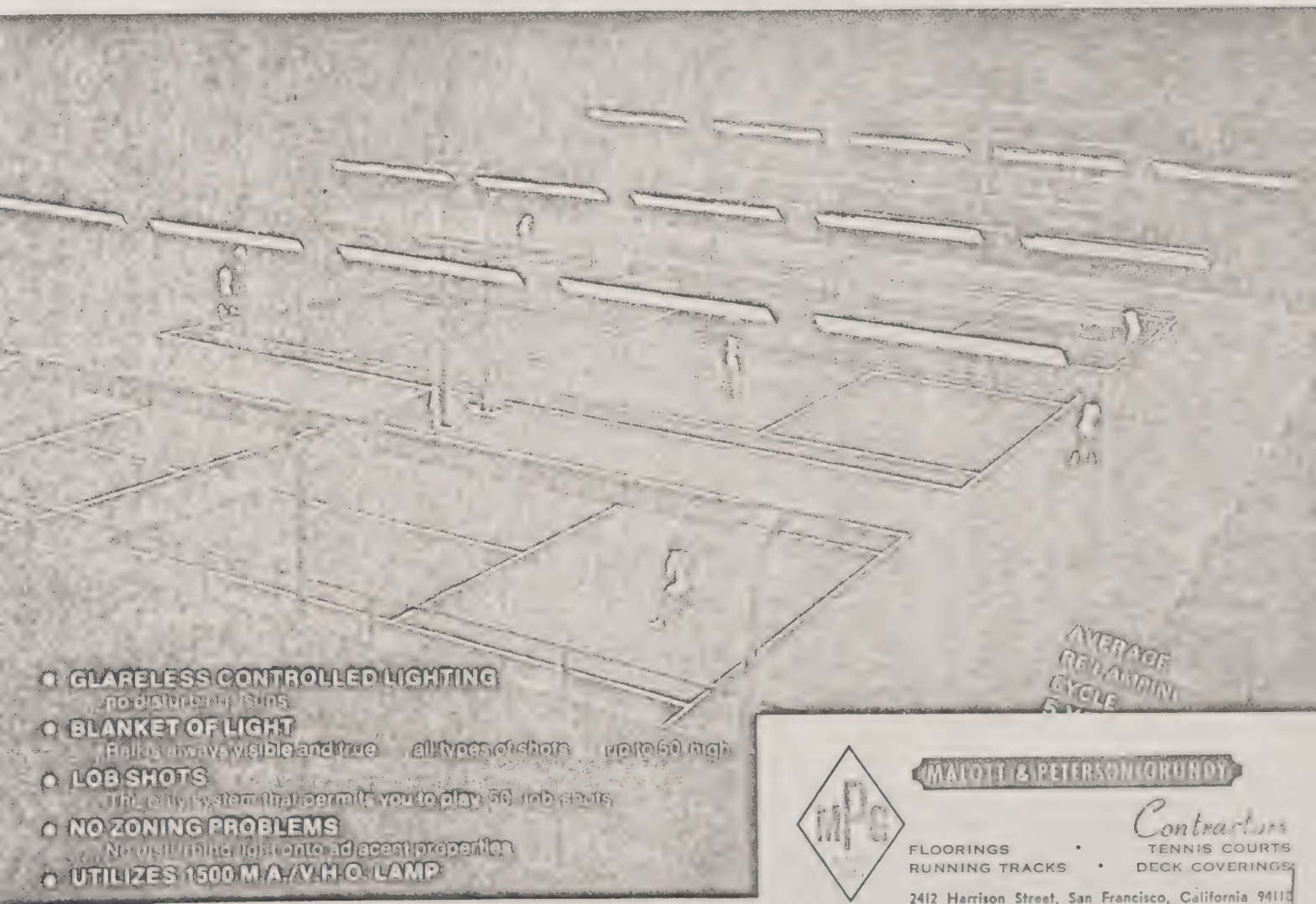
ONLY the DEVOE LIGHTING SYSTEM STOPS . . . "STROBE" & "MULTI-SUNS"

Night outdoor Tennis has never gained popularity due to strobe, light levels, and blinding glare (multi-suns . . . poles with high intensity flood lighting) until the innovation of the Devoe system.

Tennis strobe is an optical illusion of the ball in flight, when the ball passes through various intensities of light which is always created by point sources. The ball develops optical illusions in flight such as double images, fuzz balls and it also appears to change speeds.

Strobe (in Tennis Play) is always created by point sources (high intensity lighting such as metal halide, quartz or flood lighting). Regardless of how it is spaced or the number of units used, strobe will be developed, as well as blinding multi-suns. Strobe is physically and mentally devastating to the Tennis player.

"DEVOE'S TOURNAMENT TENNIS SYSTEMS PROVEN WORLD'S FINEST LIGHTING FOR OUTDOOR NIGHT TENNIS"



- **GLARELESS CONTROLLED LIGHTING**
  no disturbing Suns
- **BLANKET OF LIGHT**
  Balls always visible and true all types of shots up to 50 mph
- **LOB SHOTS**
  The only system that permits you to play 50 lob shots
- **NO ZONING PROBLEMS**
  No spill light onto adjacent properties
- **UTILIZES 1500 M.A./V. H.O. LAMP**

The DEVOE system is engineered by environmental experts to simulate near conditions for pleasurable Outdoor Night Tennis.

A cleverly engineered, unobtrusive, low mounted linear lighting system (only 55 footcandles averaged through the playing space from 4 feet to 20 feet. glareless, comfortable environment keeps the ball visible and true under all t shots. DEVOE's unique low mounting height keeps the under side of the b during lob shots and makes it clearly visible and true in trajectory against the glareless background of our lighting system.

It is important to note that the DEVOE power saving system consumes only 15 K.W., while other schemes operate up to 25 K.W. or more, yet other arrangements achieve only half the footcandles.

MALOTT & PETERSON GRUNDY
Contractors
FLOORINGS • TENNIS COURTS
RUNNING TRACKS • DECK COVERINGS
2412 Harrison Street, San Francisco, California 94110
Telephone (415) 282-1600

ROGER C. THOMPSON

SANTA CLARA • BERKELEY • DENVER • EL PASO
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215a

The NUMBER ONE manufacturer for all tennis environmental systems

REVOLUTIONARY BREAKTHR

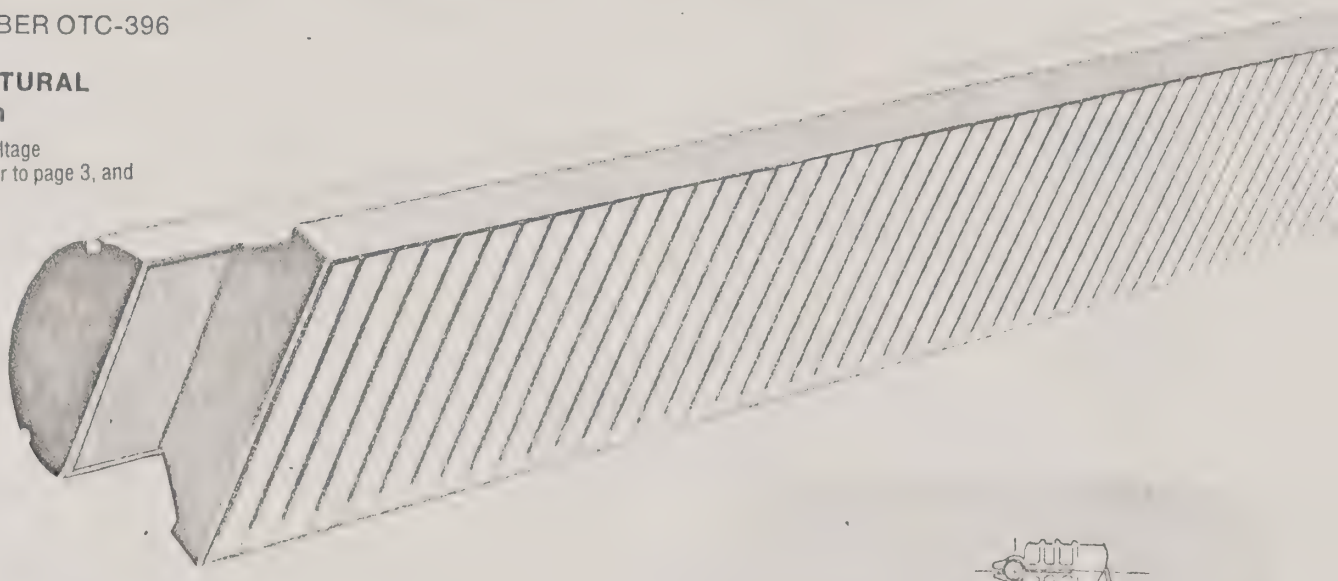
CONTROLLED OPTICAL TRAIN

The Devoe reflector and baffle system has been engineered for the most efficient distribution and light control at all elevations specifically designed for outdoor night tennis environment.

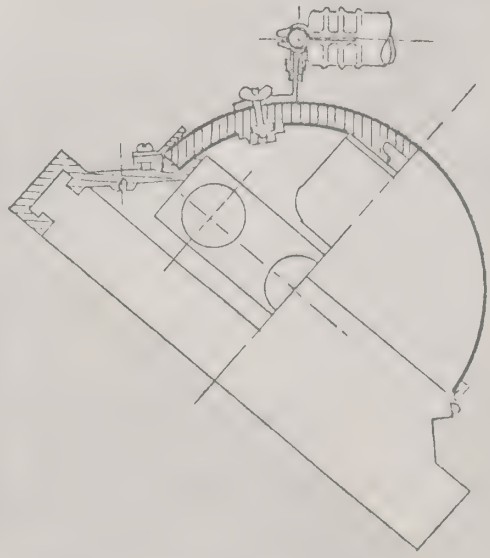
The unique glare control baffle system also protects luminaire from impact of the ball. This system provides TRUE ball visibility from the ground to over 50 ft. lob shots.

CATALOG NUMBER OTC-396
17 FOOT
TENNIS STRUCTURAL
luminaire system

Please specify ballast voltage
(For hanging system refer to page 3, and Bulletin T-30A)



SLIM PROFILE. . .
luminaire and its elegant supports blend with and become part of the fence structure.



THE ULTIMATE IN QUALITY. . .
LOWEST IN COST, INSTALLATION AND MAINTENANCE!

DEVOE's unique lighting system for outdoor tennis provides a most comfortable blanket of uniform light provides 55 footcandles averaged through the playing space from 4 feet to 20 feet. This system utilizes linear, baffled light sources with very high output lamp on only 15 foot mountings. It completely eliminates blinding glare, yet permits the player to clearly see all shots . . . from ground level to (lob shots) up to 50 ft. The low, unobtrusive mounting system facilitates speed of installation, (in many cases can utilize existing fence posts) erection, and blends harmoniously into the pleasurable outdoor night tennis.

SYSTEM SPECIFICATIONS

MECHANICAL: Luminaires have an extruded aluminum housing 17' long, (weather and insect proof), with an extruded aluminum frame baffle system. The fully adjustable receivers on the luminaire permit flexibility in mounting.

DEVOE's unique heat transfer and heat sink design keeps ballasts cool for extra long lamp and ballast life.

OPTICAL: A precision engineered reflector/baffle system provides 55 footcandles averaged through the playing space from 4 feet to 20 feet.

DEVOE's baffle system provides glareless controlled lighting.

ELECTRICAL: Complete system consists of 10 luminaires per court, with a nominal power consumption of only 15 K.W. Luminaire utilizes the very high output, thermal protected ballast, available in all voltages. The 1500 MA V.H.O. lamp is a standard lamp, rated at 14,500 initial lumens. One circuit is generally required to energize an entire row of lighting. See top of page 3. (Refer to page 4 for PLUG-IN installation.)

MOUNTING: System is designed to withstand up to 100 mph winds. Complete details for brackets, foundations and cable suspension are on adjacent page.

DEVOE's unique system is designed for ease of mounting. It can utilize all existing fence structure when they meet structural requirements.

Complete instructions for installations and supplied for each job . . . as required.

DEVOE'S PLUG-IN SYSTEM

Only when specifically ordered (not standard)

SAVINGS OF 50% ON LABOR COSTS

Each unit plugs into adjoining unit (in a row) . . . the first unit plugs directly into a water-tight receptical.

This complete Plug-In system can be installed by a maintenance man. There is no need for an electrical contractor to install this lighting system, (except for end receptical, located on top of fence or post area). The first unit of each row plugs into this receptical.

It's as easy as plugging in your home T.V.!



DEVOE'S COMPLETE "OUTDOOR" LIGHTING SYSTEM is the ONLY correct way to light a BUBBLE installation!

- Posts are designed to fit contour of the bubble.
- Permits complete freedom for players (no post obstructions)
- Simple removal of bubble



MONEY-SAVING ELECTRICAL INSTALLATION

PRE-WIRED!
Including
Raceway
Wiring

DEVOE provides (as standard) seal-tite armored fittings pre-assembled at our factory. All hardware is also pre-assembled. No other electrical fittings are required by contractor.



Units are supplied with internal wiring from one end of the unit to the other. Only the small splice box area has to be opened on either end for wiring one unit to the other. All wire leads going from one fixture to the other are provided and installed at factory.



EASY-QUICK INSTALLATION

Lay out the luminaires on the ground in the position you intend to install. A five fixture run consists of (1) Feed side, (3) Intermediates and (1) End of Run. Each fixture is carefully marked and labeled. You start off with the feed fixture, labeled feed side. This fixture contains on one end, a seal-tite fitting to receive your initial feed connection. On the other end is a splice box which contains leads approximately 48 inches to connect to the adjoining fixture.

For further information contact

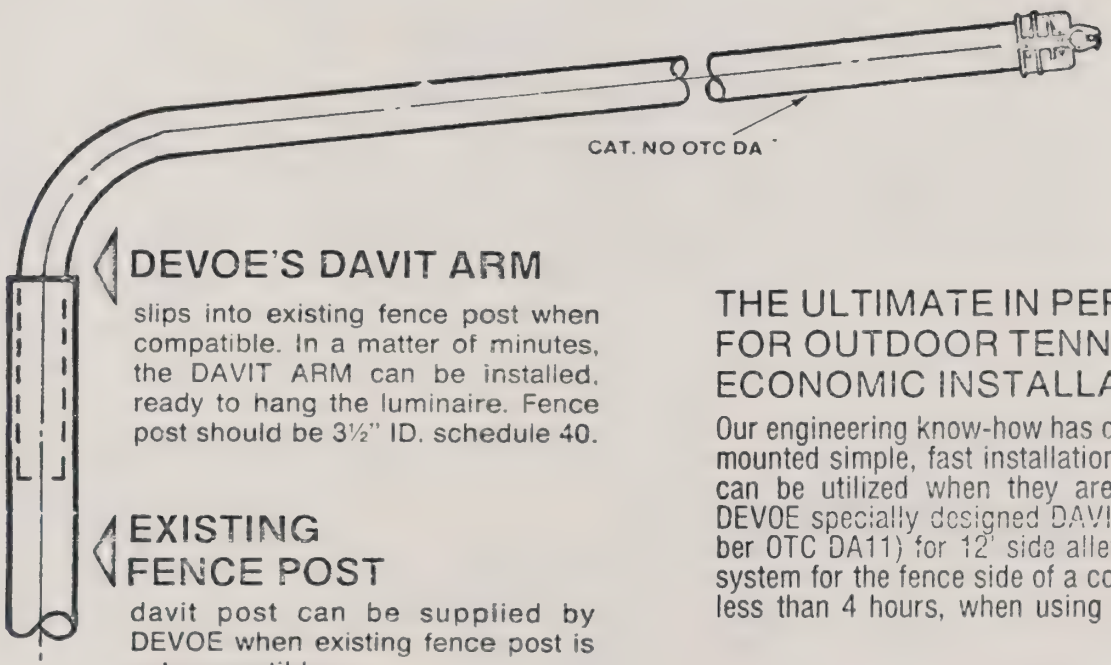
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UGH





DEVOE'S DAVIT ARM

slips into existing fence post when compatible. In a matter of minutes, the DAVIT ARM can be installed, ready to hang the luminaire. Fence post should be 3½" ID. schedule 40.

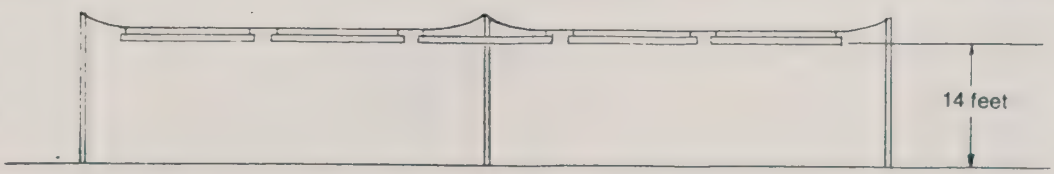
EXISTING FENCE POST

davit post can be supplied by DEVOE when existing fence post is not compatible.

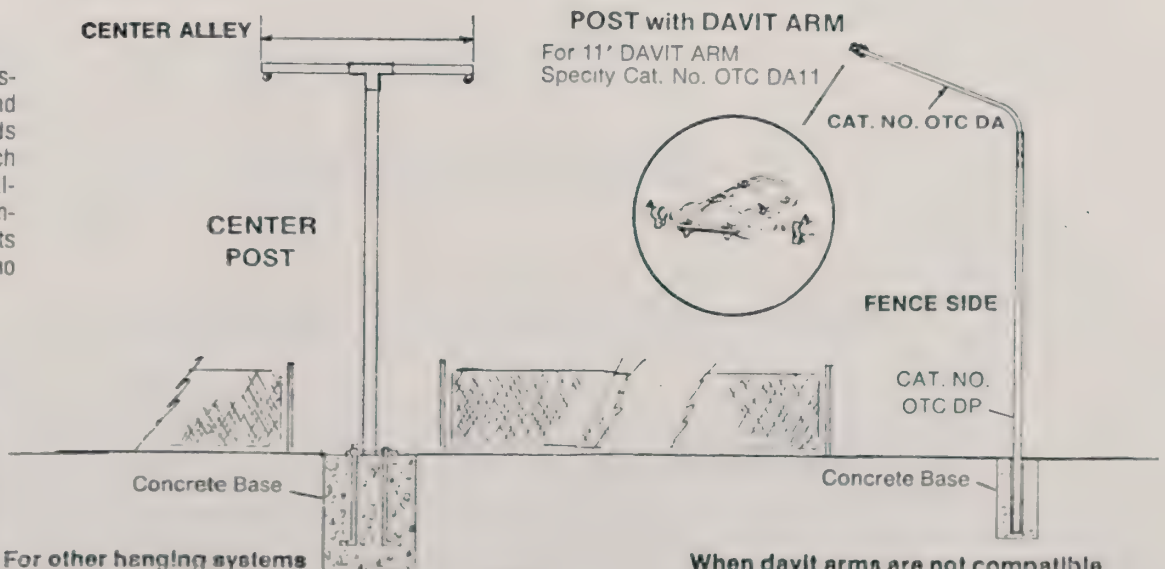
THE ULTIMATE IN PERFORMANCE. . . FOR OUTDOOR TENNIS LIGHTING. . . ECONOMIC INSTALLATIONS

Our engineering know-how has developed a unique low mounted simple, fast installation. Existing fence posts can be utilized when they are compatible with the DEVOE specially designed DAVIT ARM (Catalog Number OTC DA11) for 12' side alley. A complete lighting system for the fence side of a court can be installed in less than 4 hours, when using existing fence posts.

CENTER ALLEY SUSPENSION SYSTEM



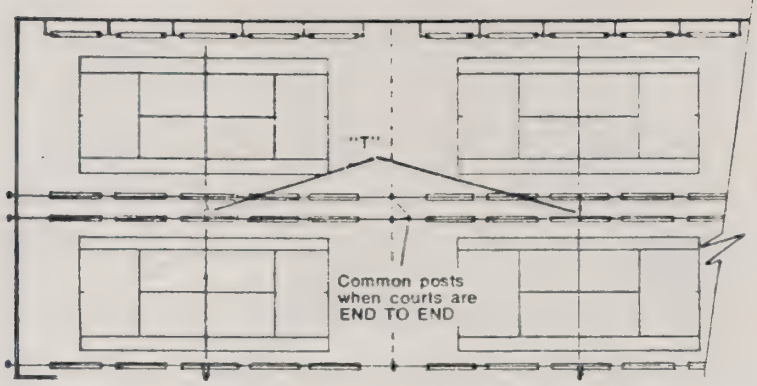
The Center Alley Suspension System provides a structurally sound assembly, which withstands winds of up to 100 M.P.H. Each suspension system (for center alley) is designed to hold 10 luminaires. DEVOE'S design permits complete freedom for player (no post obstructions).



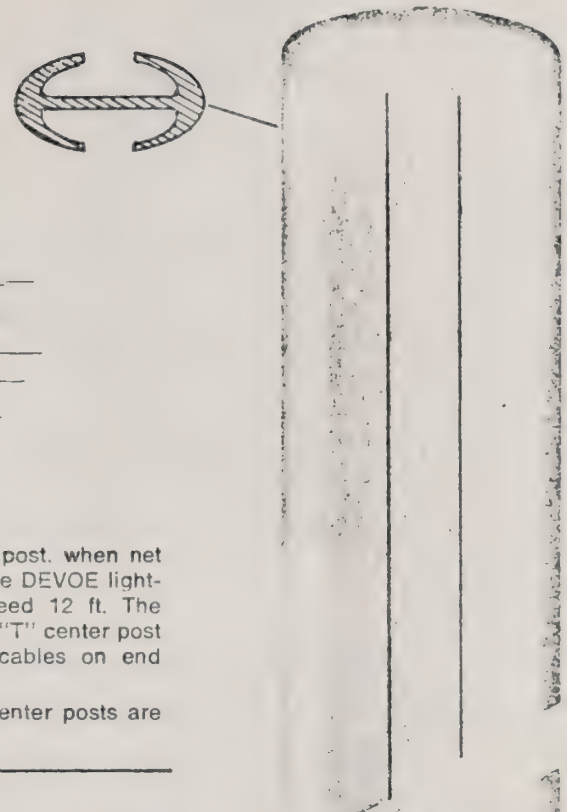
FOR COMPLETE ENGINEERING INFORMATION CONTACT DEVOE

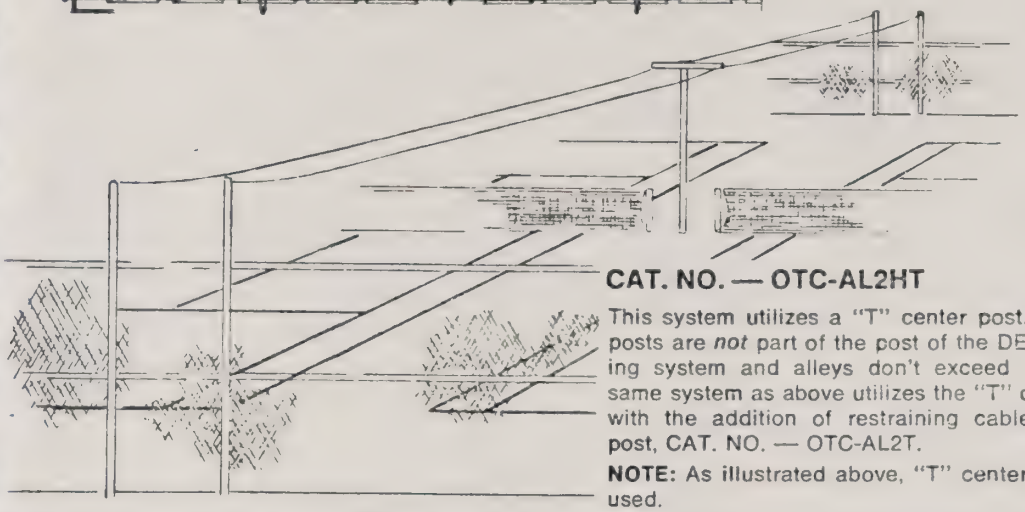
For other hanging systems refer to Bulletin T-30A.

When davit arms are not compatible refer to Bulletin T-30A.



Elliptical Nautical Aluminum Post!





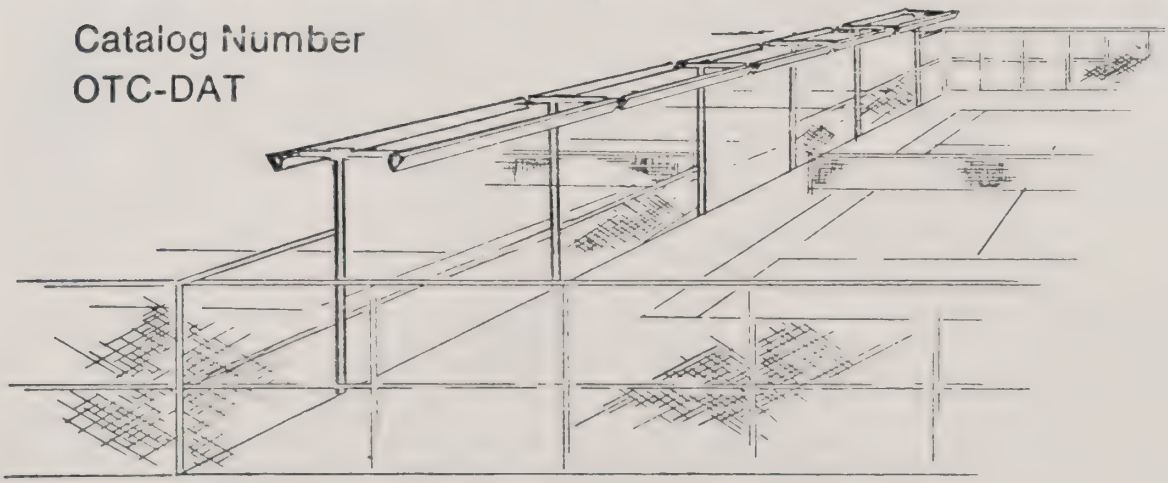
CAT. NO. — OTC-AL2HT

This system utilizes a "T" center post. when net posts are *not* part of the post of the DEVOE lighting system and alleys don't exceed 12 ft. The same system as above utilizes the "T" center post with the addition of restraining cables on end post, CAT. NO. — OTC-AL2T.

NOTE: As illustrated above, "T" center posts are used.

A CENTER ALLEY FENCE POST 'T' ASSEMBLY

Catalog Number
OTC-DAT



FAST — EASY — LOW COST HANGING SYSTEM

This unique design permits the use of center alley dividers as receivers for the DEVOE 'T' systems.

Simply connect the 'T' to the compatible existing post (either internally or externally). After this is completed. the luminaires are then hung in the same manner as the Davit Arm (OTC-DA) procedure.

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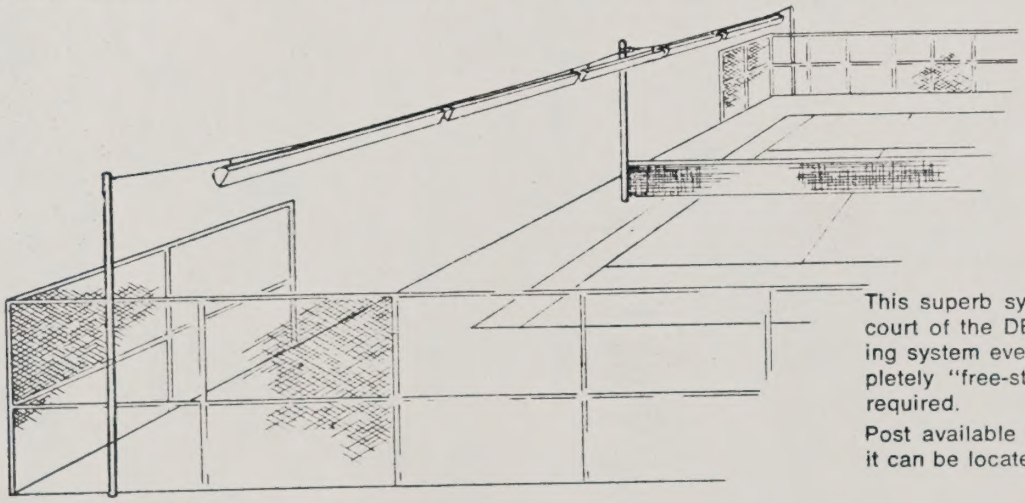
DEVOE'S NAUTICAL ALUMINUM SUPPORT SYSTEMS:

14 SYSTEMS

"NO OTHER SYSTEMS CAN COMPARE TO ITS PERFORMANCE!...HEADS ABOVE ALL"...is what the W.C.T. pros are saying about the DEVOE system.

The outstanding, superb, high performance of the DEVOE Night Outdoor Tennis system is enhanced by the unique mounting arrangements as shown with catalog numbers. These systems are applicable to every Tennis court condition feasible. The elliptical nautical post adds a richness of quality to the overall Tennis environment.

Complete engineering drawings and foundation details are available for each of the systems shown. These systems are designed for high speed installation. After the foundations are installed on the court, the complete lighting system, including the hanging system, can be installed in a matter of one day with three men. Posts are constructed of aluminum, light in weight, not requiring cranes or any lifting equipment.



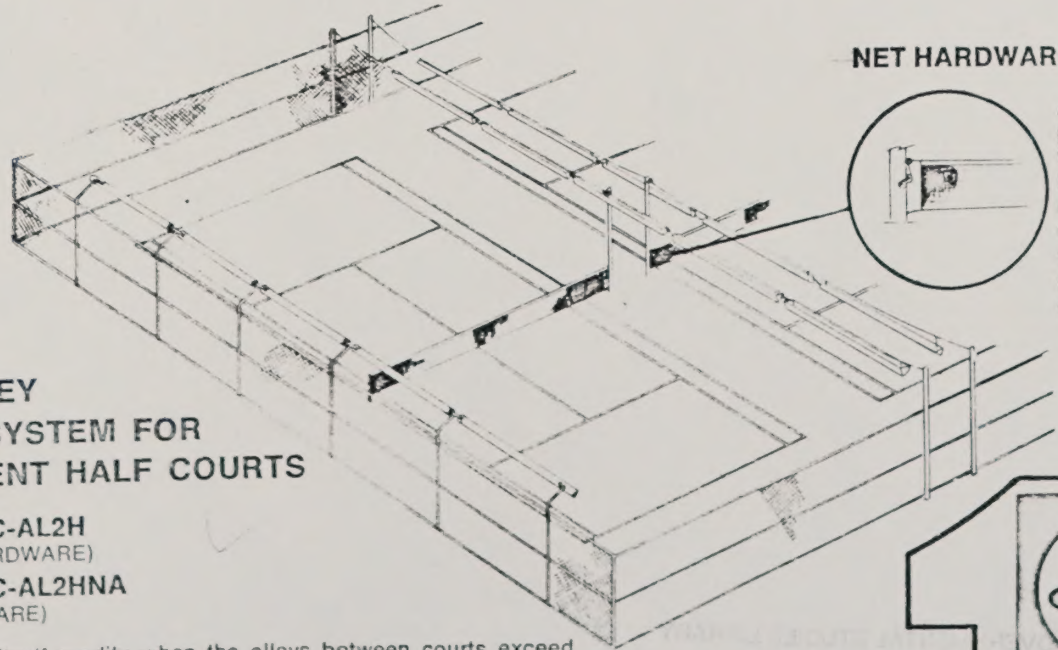
THE HALF COURT CATENARY SYSTEM!

CAT. NO. — OTC-ALH
(WITHOUT NET HARDWARE)

CAT. NO. — OTC-ALHNA
(WITH NET HARDWARE)

This superb system permits you to install a half court of the DEVOE Outdoor Night Tennis Lighting system even when there is no fence . . . Completely "free-standing" — no restraining cables required.

Post available with net mounting hardware . . . or it can be located one foot from net post.



NET HARDWARE/POST SYSTEM

All net hardware is incorporated with the post of the lighting system, eliminating the use of net post and additional post foundations.

This is optional hardware to the applicable systems.

CENTER ALLEY CATENARY SYSTEM FOR TWO ADJACENT HALF COURTS

CAT. NO. — OTC-AL2H
(WITHOUT NET HARDWARE)

CAT. NO. — OTC-AL2HNA
(WITH NET HARDWARE)

This system adapts itself readily when the alleys between courts exceed 12 ft. or where the net hardware is part of the post system.

This catenary system is completely "free-standing" — no restraining cables required.

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